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For related information see also *Astronautics*.

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VOLUME 24 NUMBER 6 / MARCH 23, 1986

TABLE OF CONTENTS

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics.*

01 AERONAUTICS (GENERAL) **879**

02 AERODYNAMICS **879**

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*

03 AIR TRANSPORTATION AND SAFETY **884**

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION **885**

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command and Tracking* and *32 Communications.*

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE **885**

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

06 AIRCRAFT INSTRUMENTATION **890**

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

07 AIRCRAFT PROPULSION AND POWER **891**

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

08 AIRCRAFT STABILITY AND CONTROL **891**

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

09 RESEARCH AND SUPPORT FACILITIES (AIR) **893**

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

For related information see also *Aeronautics*

12 ASTRONAUTICS (GENERAL) **894**

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

13 ASTRODYNAMICS **N.A.**

Includes powered and free-flight trajectories; and orbit and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) **N.A.**

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air).*

15 LAUNCH VEHICLES AND SPACE VEHICLES **N.A.**

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

16 SPACE TRANSPORTATION **895**

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

17 SPACECRAFT COMMUNICATION, COMMAND AND TRACKING **895**

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE **896**

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

19 SPACECRAFT INSTRUMENTATION **N.A.**

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

20 SPACECRAFT PROPULSION AND POWER **896**

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

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23 CHEMISTRY AND MATERIALS (GENERAL) 897
Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS 898
Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY 899
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.
For related information see also *77 Thermodynamics and Statistical Physics.*

26 METALLIC MATERIALS 902
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 906
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS 909
Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

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For related information see also *Physics.*

31 ENGINEERING (GENERAL) 911
Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS 926
Includes land and global communications; communications theory; and optical communications.
For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

33 ELECTRONICS AND ELECTRICAL ENGINEERING 933
Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.
For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

34 FLUID MECHANICS AND HEAT TRANSFER 948
Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

35 INSTRUMENTATION AND PHOTOGRAPHY 952
Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.
For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation.*

36 LASERS AND MASERS 955
Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 957
Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY 958
Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS 959
Includes structural element design and weight analysis; fatigue; and thermal stress.
For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

GEOSCIENCES

Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.
For related information see also *Space Sciences.*

42 GEOSCIENCES (GENERAL) 961

43 EARTH RESOURCES 963
Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography.*

44 ENERGY PRODUCTION AND CONVERSION 966
Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

45 ENVIRONMENT POLLUTION 968
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

46 GEOPHYSICS 969
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.
For space radiation see *93 Space Radiation.*

47 METEOROLOGY AND CLIMATOLOGY 973
Includes weather forecasting and modification.

48 OCEANOGRAPHY 984
Includes biological, dynamic and physical oceanography; and marine resources.

LIFE SCIENCES

Includes sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and planetary biology.

51 LIFE SCIENCES (GENERAL) 987
Includes genetics.

52 AEROSPACE MEDICINE 993
Includes physiological factors; biological effects of radiation; and weightlessness.

53 BEHAVIORAL SCIENCES 997
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT 998
Includes human engineering; biotechnology; and space suits and protective clothing.

55 PLANETARY BIOLOGY N.A.
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MATHEMATICAL AND COMPUTER SCIENCES

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59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) N.A.

60 COMPUTER OPERATIONS AND HARDWARE 999
Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

61 COMPUTER PROGRAMMING AND SOFTWARE 1003
Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS 1008
Includes computer networks.

63 CYBERNETICS 1009
Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

64 NUMERICAL ANALYSIS 1009
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY 1014
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS 1016
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67 THEORETICAL MATHEMATICS 1016
Includes topology and number theory.

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For related information see also *Engineering.*

70 PHYSICS (GENERAL) 1016
For geophysics see *46 Geophysics.* For astrophysics see *90 Astrophysics.* For solar physics see *92 Solar Physics.*

71 ACOUSTICS 1017
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution.*

72 ATOMIC AND MOLECULAR PHYSICS 1020
Includes atomic structure and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS 1023
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation.*

74 OPTICS 1025
Includes light phenomena.

75 PLASMA PHYSICS 1026
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics.*

76 SOLID-STATE PHYSICS 1031
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

77 THERMODYNAMICS AND STATISTICAL PHYSICS 1034
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

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80 SOCIAL SCIENCES (GENERAL) **1035**
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT **1035**
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE **1036**
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS **N.A.**
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE **1037**
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION **1038**
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) **N.A.**

89 ASTRONOMY **1038**
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS **1038**
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **1040**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **1040**
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **1041**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

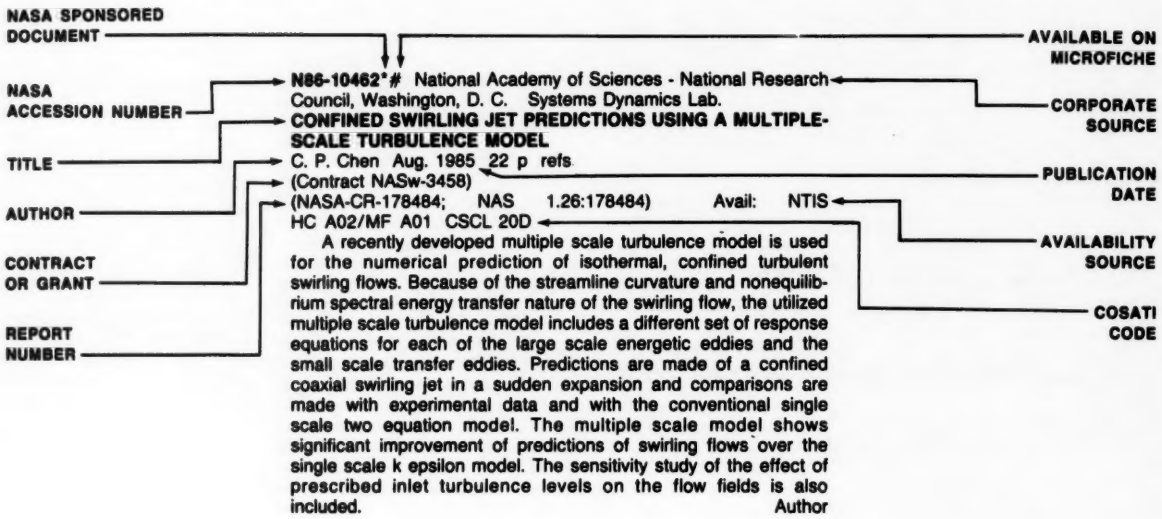
GENERAL

99 GENERAL **1041**

Note: N.A. means that no abstracts were assigned to this category for this issue.

SUBJECT INDEX **I-1**
PERSONAL AUTHOR INDEX **I-61**
CORPORATE SOURCE INDEX **I-69**
CONTRACT NUMBER INDEX **I-81**
REPORT/ACCESSION NUMBER INDEX **I-83**

TYPICAL CITATION AND ABSTRACT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N86-10462*# National Academy of Sciences - National Research Council, Washington, D. C. Systems Dynamics Lab.
CORPORATE SOURCE
TITLE
CONFINED SWIRLING JET PREDICTIONS USING A MULTIPLE-SCALE TURBULENCE MODEL
AUTHOR
C. P. Chen Aug. 1985 22 p refs
PUBLICATION DATE
CONTRACT OR GRANT
(Contract NASw-3458)
REPORT NUMBER
(NASA-CR-178484; NAS 1.26:178484) Avail: NTIS
AVAILABILITY SOURCE
HC A02/MF A01 CSCL 20D
COSATI CODE
A recently developed multiple scale turbulence model is used for the numerical prediction of isothermal, confined turbulent swirling flows. Because of the streamline curvature and nonequilibrium spectral energy transfer nature of the swirling flow, the utilized multiple scale turbulence model includes a different set of response equations for each of the large scale energetic eddies and the small scale transfer eddies. Predictions are made of a confined coaxial swirling jet in a sudden expansion and comparisons are made with experimental data and with the conventional single scale two equation model. The multiple scale model shows significant improvement of predictions of swirling flows over the single scale k epsilon model. The sensitivity study of the effect of prescribed inlet turbulence levels on the flow fields is also included. Author

VOLUME 24 NUMBER 6 / MARCH 23, 1986

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N86-15240# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
[ACTIVITIES REPORT IN AEROSPACE RESEARCH] Annual Report, 1984 [KONZERN-GESCHAEFTSBERICHT 1984]
Jun. 1985 43 p In GERMAN Original contains color illustrations
Avail: NTIS HC A03/MF A01

Research concerning helicopters, transport aircraft, and airliners, astronautics, and defense are discussed. Energy and process techniques are studied. Author (ESA)

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N86-15241 Old Dominion Univ., Norfolk, Va.
STUDIES ON THE INTERFERENCE OF WINGS AND PROPELLER SLIPSTREAMS Ph.D. Thesis
Ramadas Prabhu 1985 114 p Previously announced as N85-17553
Avail: Univ. Microfilms Order No. DA8517782

The small disturbance potential flow theory is applied to determine the lift of an airfoil in a nonuniform parallel stream. The given stream is replaced by an equivalent stream with a certain number of velocity discontinuities, and the influence of these discontinuities is obtained by the method of images. Next, this method is extended to the problem of an airfoil in a nonuniform stream of smooth velocity profile. This model allows perturbation velocity potential in a rotational undisturbed stream. A comparison of these results with numerical solutions of Euler equations indicates that, although approximate, the present method provides useful information about the interaction problem while avoiding the need to solve the Euler equations. Author

N86-15242# Cranfield Inst. of Tech., Bedford (England). Coll. of Aeronautics.
THE EXPERIMENTAL DETERMINATION OF THE SUBSONIC AERODYNAMIC CHARACTERISTICS OF AN OGIVE-CYLINDER BODY INCLUDING A COMPARISON WITH THEORETICAL ESTIMATES, VOLUME 1
D. I. T. P. Llewelyn-Davies Jun. 1985 78 p refs
(CAR-8509; ISBN-0-9477-67-24-X) Avail: NTIS HC A05/MF A01

Wind tunnel tests made on an ogive cylinder body of 6:1 fineness ratio are reported. The distribution of pressure on the body was measured over an incidence range of -1 to 10 degrees. The local loading distributions were obtained by integration of the pressure coefficients; further integration yielded the overall normal force and pitching moment coefficients and hence the center of pressure position. It is shown that the aerodynamic characteristics are very sensitive to conditions in the base region and that unexpectedly large loadings are present over the last 10% of the body length. It is indicated that the bluff asymmetric model support system may be the source of some additional interference effects at the higher incidences, even though it is some 3.7 body diameters downstream of the base. The experimental results are compared with theoretical estimates obtained by an inviscid ring-source method of estimation for axisymmetrical bodies. E.A.K.

N86-15243*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PERFORMANCE AND LOADS DATA FROM A HOVER TEST OF A FULL-SCALE XV-15 ROTOR
Fort F. Felker, Mark D. Betzina, and David B. Signor Nov. 1985 97 p refs
(NASA-TM-86833; Rept-85404; NAS 1.15:86833) Avail: NTIS HC A05/MF A01 CSCL 01A

A hover test of a full-scale XV-15 rotor was conducted at the Outdoor Aerodynamic Research Facility at Ames Research Center. The primary objective of the test was to obtain accurate measurements of the hover performance of the original, metal-blade XV-15 rotor system. Data were acquired for rotor tip Mach numbers ranging from 0.60 to 0.73. This report presents data on rotor performance, rotor wake downwash velocities, and rotor loads. Author

N86-15244*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
RELATIVE ADVANTAGES OF THIN-LAYER NAVIER-STOKES AND INTERACTIVE BOUNDARY-LAYER PROCEDURES
Unmeel Mehta, K. C. Chang (Douglas Aircraft Co., Long Beach, Calif.), and Tuncer Cebeci (Douglas Aircraft Co., Long Beach, Calif.) Nov. 1985 52 p refs
(NASA-TM-86778; A-85346; NAS 1.15:86778) Avail: NTIS HC A04/MF A01 CSCL 01A

Numerical procedures for solving the thin-shear-layer Navier-Stokes equations and for the interaction of solutions to inviscid and boundary-layer equations are described and evaluated. To allow appraisal of the numerical and fluid dynamic abilities of the two schemes, they have been applied to one airfoil as a function of angle of attack at two slightly different Reynolds numbers. The NACA 0012 airfoil has been chosen because it allows comparison with measured lift, drag, and moment and with surface-pressure distributions. Calculations have been performed with algebraic eddy-viscosity formulations, and they include consideration of transition. The results are presented in a form that allows easy appraisal of the accuracy of both procedures and of the relative costs. The interactive procedure is computationally efficient but restrictive relative to the thin-layer Navier-Stokes procedure. The latter procedure does a better job of predicting drag than does the former. In both procedures, the location of transition is crucial for accurate or detailed computations, particularly at high

angles of attack. When the upstream influence of pressure field through the shear layer is important, the thin-layer Navier-Stokes procedure has an edge over the interactive procedure. Author

N86-15245*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HYPERSONIC CHARACTERISTICS OF AN ADVANCED AEROSPACE PLANE AT MACH 20.3
Ronald S. McCandless Dec. 1985 28 p refs
(NASA-TM-86435; L-15953; NAS 1.15:86435) Avail: NTIS HC A03/MF A01 CSCL 01A

Wind-tunnel studies have been performed in the Langley Hypersonic Helium Tunnel Facility to obtain static longitudinal and lateral-directional aerodynamic characteristics of an advanced aerospace plane concept. The nominal test conditions are a Mach number of 20.3 and a Reynolds number of 6.8 x 10 to the 6th power per foot at angles of attack from 0 to 25 deg and angles of sideslip of -3 and 0 deg. Stability and control characteristics are obtained for several deflections of the elevators, elevons, and rudder. In addition, a modified canopy is examined. The results indicate that this vehicle is longitudinally stable at angles of attack near the maximum lift-drag ratio. Also, the vehicle is shown to be directionally unstable with positive dihedral effect. Author

N86-15246*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A CONSISTENT SPATIAL DIFFERENCING SCHEME FOR THE TRANSONIC FULL-POTENTIAL EQUATION IN THREE DIMENSIONS
Scott D. Thomas and Terry L. Holst Dec. 1985 18 p refs
(NASA-TM-86716; Rept-85213; NAS 1.15:86716) Avail: NTIS HC A02/MF A01 CSCL 01A

A full-potential steady transonic wing flow solver has been modified so that freestream density and residual are captured in regions of constant velocity. This numerically precise freestream consistency is obtained by slightly altering the differencing scheme without affecting the implicit solution algorithm. The changes chiefly affect the fifteen metrics per grid point, which are computed once and stored. With this new method, the outer boundary condition is captured accurately, and the smoothness of the solution is especially improved near regions of grid discontinuity. Author

N86-15247*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SEPARATED TRANSONIC AIRFOIL FLOW CALCULATIONS WITH A NONEQUILIBRIUM TURBULENCE MODEL
L. S. King and D. A. Johnson Nov. 1985 20 p refs
(NASA-TM-86830; A-85397; NAS 1.15:86830) Avail: NTIS HC A02/MF A01 CSCL 01A

Navier-Stokes transonic airfoil calculations based on a recently developed nonequilibrium, turbulence closure model are presented for a supercritical airfoil section at transonic cruise conditions and for a conventional airfoil section at shock-induced stall conditions. Comparisons with experimental data are presented which show that this nonequilibrium closure model performs significantly better than the popular Baldwin-Lomax and Cebeci-Smith equilibrium algebraic models when there is boundary-layer separation that results from the inviscid-viscous interactions. Author

N86-15248*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INVESTIGATION OF A SUPERSONIC CRUISE FIGHTER MODEL FLOW FIELD
David E. Reubush and E. Ann Bare Nov. 1985 150 p refs
(NASA-TM-86361; L-15884; NAS 1.15:86361) Avail: NTIS HC A07/MF A01 CSCL 01A

An investigation was conducted in the Langley 16-Foot Transonic Tunnel to survey the flow field around a model of a supersonic cruise fighter configuration. Local values of angle of attack, side flow, Mach number, and total pressure ratio were measured with a single multi-holed probe in three survey areas on a model previously used for nacelle/nozzle integration investigations. The investigation was conducted at Mach numbers of 0.6, 0.9, and 1.2, and at angles of attack from 0 deg to 10 deg. The purpose of the investigation was to provide a base of experimental data with which theoretically determined data can be compared. To that end the data are presented in tables as well as graphically, and a complete description of the model geometry is included as fuselage cross sections and wing span stations. Measured local angles of attack were generally greater than free stream angle of attack above the wing and generally smaller below. There were large spanwise local angle-of-attack and side flow gradients above the wing at the higher free stream angles of attack. Author

N86-15249*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FUNDAMENTAL STUDY OF FLOW FIELD GENERATED BY ROTORCRAFT BLADES USING WIDE-FIELD SHADOWGRAPH
S. P. Parthasarathy, Y. I. Cho, and L. H. Back 1 Oct. 1985 41 p refs
(Contract NAS7-918)
(NASA-CR-176443; JPL-Pub-85-64; NAS 1.26:176443) Avail: NTIS HC A03/MF A01 CSCL 01A

The vortex trajectory and vortex wake generated by helicopter rotors are visualized using a wide-field shadowgraph technique. Use of a retro-reflective Scotchlite screen makes it possible to investigate the flow field generated by full-scale rotors. Tip vortex trajectories are visible in shadowgraphs for a range of tip Mach number of 0.38 to 0.60. The effect of the angle of attack is substantial. At an angle of attack greater than 8 degrees, the visibility of the vortex core is significant even at relatively low tip Mach numbers. The theoretical analysis of the sensitivity is carried out for a rotating blade. This analysis demonstrates that the sensitivity decreases with increasing dimensionless core radius and increases with increasing tip Mach number. The threshold value of the sensitivity is found to be 0.0015, below which the vortex core is not visible and above which it is visible. The effect of the optical path length is also discussed. Based on this investigation, it is concluded that the application of this wide-field shadowgraph technique to a large wind tunnel test should be feasible. In addition, two simultaneous shadowgraph views would allow three-dimensional reconstruction of vortex trajectories. Author

N86-15250# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Materials Engineering.
EARLY TRANSONIC IDEAS IN THE LIGHT OF LATER DEVELOPMENTS
J. D. Cole 6 Aug. 1985 42 p
(Grant AF-AFOSR-0155-82)
(AD-A159101; AFOSR-85-0694TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

A survey is given of early ideas about transonic flow and their current interpretation. GRA

N86-15251# Royal Aircraft Establishment, Farnborough (England).
A RAPID METHOD FOR ESTIMATING EQUIVALENT PARABOLIC POLARS FROM WIND-TUNNEL TESTS
D. E. Lean and S. P. Fiddes Apr. 1985 19 p
(AD-A159559; RAE-TM-AERO-2034; DRIC-BR-96601) Avail: NTIS HC A02/MF A01 CSCL 14/2

A method for obtaining a best-fit parabolic drag polar from measured force results is presented. The method is used in estimating the blockage correction due to separated flow that must be applied to wind tunnel results. An important part of the method is the use of computer graphics to identify the part of the measured drag polar that may best be described by a parabola, and thus used as the basis for a curve fit. The method is fast, when compared to existing curve-fitting techniques, and suited to use with an online data reduction system. GRA

N86-15252# Institut Franco-Allemand de Recherches, St. Louis (France).
VORTICES AND PRESSURE WAVES AT TRAILING EDGES
F. Seiler and J. Srulijes 16 Aug. 1984 10 p refs Presented at 16th International Congress on High Speed Photography and

Photonics, Strasbourg, France, 27-31 Aug. 1984
(ISL-CO-224/84) Avail: NTIS HC A02/MF A01

Shock tube experiments using differential interferometry were carried out to investigate compressible subsonic flows around and behind flat plates and cylinders. Pictures taken at framing speeds up to 2 million frames/sec second and streak records show that the trailing edge vortex separation induces pressure waves moving upstream. Each vortex separation is related to the formation of a pressure wave. The flow around the bodies is influenced by the shedding frequency and is possibly coupled with the wake. After a symmetrical onset, the process of vortex separation and pressure wave generation develops into an asymmetrical wake with alternating separation. The experiments show that the dynamics of vortices close to the trailing edge is practically inviscid and incompressible. The pressure waves moving upstream must be treated as a problem of purely compressible nature. Author (ESA)

N86-15253# Institut Franco-Allemand de Recherches, St. Louis (France).
DAMPING OF THE ROLLING MOTION OF FULL CALIBER FIN-STABILIZED PROJECTILES IN SUPERSONIC FLIGHT
M. Giraud 21 Nov. 1984 17 p refs Presented at 8th International Symposium on Ballistics, Orlando, Fla., 23-25 Oct. 1984
(ISL-CO-233/84) Avail: NTIS HC A02/MF A01

Simultaneous measurements conducted on fin-stabilized projectiles in supersonic flight by recording the longitudinal velocity (V) with a Doppler radar and the roll velocity (p) by a radioelectric telemetering device are used to determine the variation of the roll damping moment coefficient as a function of the reduced roll velocity p/V. The variation of p/V as a function of the distance travelled is also determined. Launching the projectiles with a glide band at different initial velocities from gun barrels with different angles of twist increases the range of the reduced roll velocities in the ratio of 1 to 4. The roll damping moment coefficient varies strongly in the ratio of 1 to 8.5. In the Mach number range from 1.5 to 3.3, the action of the Mach number on the coefficient is shown. The proportionality of the roll damping moment coefficient to the reduced roll velocity is verified over the range 12 to 44 rps. Author (ESA)

N86-15254# Institut Franco-Allemand de Recherches, St. Louis (France).
QUASI NONSTRETCHING HYPERVELOCITY JETS
P. Y. Chanteret and F. Jamet 13 Dec. 1984 11 p refs Presented at 8th International Symposium on Ballistics, Orlando, Fla., 23-25 Oct. 1984
(ISL-CO-236/84) Avail: NTIS HC A02/MF A01

The possibility to obtain high velocity shaped charge jets characterized by a very low velocity gradient is studied using one-dimensional calculations and experimental flash X-ray observations. Results show that it is possible to form high velocity jets with < 0.5 km/sec velocity difference between tip and rear of the jet with a kinetic energy equivalent to that of classical stretching jets. Comparison of jets is used to discuss analytical models employed to evaluate velocities, break-up, and penetration of shaped charge jets. Author (ESA)

N86-15255# Technische Hogeschool, Delft (Netherlands). Inst. voor Windenergie.
THE FLAPPING MOVEMENT AND FREQUENCY OF ROTATING WINDMILL WINGS DEFINED WITH A DIFFERENTIAL EQUATION [DE KLAPBEWEGING EN FREQUENTIE VAN DRAAIENDE WINDMOLENBLADEN BEPAALD MET EEN DIFFERENTIEVERGELIJKING]
P. A. Joosse Apr. 1985 38 p refs In DUTCH
(IW-R501) Avail: NTIS HC A03/MF A01

Two programs to determine the bending of rotating windmill wings with finite stiffness in a uniform parallel flow are described. Using this bending, the resonant frequencies, necessary for wing design are quickly determined. Both bending programs are based on a differential equation with a finite number of elements. An iteration program with an initial condition problem is presented. As this program shows divergence problems, a limiting condition program presenting a closed solution for a schematized wing, was developed. Using a lumped mass method, resonant frequencies and vibrations are accurately determined for a first draft and a large part of the design. Author (ESA)

N86-15256# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Fluid Dynamics Panel Working Group 07.
TEST CASES FOR INVISCID FLOW FIELD METHODS
Loughton, England May 1985 336 p refs
(AGARD-AR-211; ISBN-92-835-1497-1) Avail: NTIS HC A15/MF A01

The escalating costs and the continuing limitations of wind tunnel testing together with the growing imperative to achieve the optimal design have rapidly increased the importance of computational fluid dynamics in the design of military aircraft. At relevant Reynolds numbers, inviscid flow methods continue to play an essential role in this design process. In recognition of this, the AGARD Fluid Dynamics panel established Working Group 07 to specify relevant reference test cases to serve as validation bases for those developing new methods with improved accuracy and cost-effectiveness. These cases further serve as check cases for those learning to use existing production codes. The recommendations of the Working Group are presented. For individual titles, see N86-15257 through N86-15265.

N86-15257# Boeing Military Airplane Development, Seattle, Wash.
OBJECTIVES AND SCOPE OF THE WORKING GROUP 07
H. Yoshihara *In* AGARD Test Cases for Inviscid Flow Field Methods May 1985 3 p (For primary document see N86-15256 06-02)
Avail: NTIS HC A15/MF A01

The objectives and scope of the working group on test cases for inviscid flow field methods are defined. The types of solutions sort and their procedures are given. The membership of the group is given, both panel and nonpanel members. Also given is the meetings procedures. E.R.

N86-15258# Trondheim Univ. (Norway).
FORMULATION OF THE EULER BOUNDARY VALUE PROBLEM
H. Norstrud *In* AGARD Test Cases for Inviscid Flow Field Methods May 1985 56 p refs (For primary document see N86-15256 06-02)
Avail: NTIS HC A15/MF A01

Most of the obtained solutions to fluid flow problems are based on irrotational motion and, hence, can be grouped together as potential flow solutions. In many practical cases such potential approximations yields satisfactory results as compared to a rotational flow solution. The Mach number contours around an airfoil at supersonic speed is shown. For flows with strong entropy variation in the flow field the situation, however, is changed. This is especially true for embedded shocks. The Mach number contour around a cylinder for M sub infinity less than 1, and the corresponding streamlines are illustrated. The major reason behind the discrepancy between a rotational and irrotational solution lies in the fact that the potential flow solution does not satisfy the Rankine-Hugoniot jump condition across a shock. As it can be seen, an irrotational solution like the full potential solution or the transonic small perturbation solution (TSP), will yield a larger Mach number jump across the shock as compared to the equivalent rotational or Euler solution. Furthermore, the shock location will differ between a rotational and irrotational solution. It must be stated that for flows with complex shock patterns and for flows with inherent vorticity the method of solution adopted must be based on the Euler equations. The flow field around a modern combat aircraft is well suited to serve as an example to this. The calculated pressure distribution around an aircraft forebody at M sub infinity is shown. Author

N86-15259# National Aerospace Lab., Amsterdam (Netherlands).
NUMERICAL METHODS

J. W. Boerstoel *In* AGARD Test Cases for Inviscid Flow Field Methods May 1985 7 p refs (For primary document see N86-15256 06-02)
Avail: NTIS HC A15/MF A01

A survey of numerical techniques used in computational simulations of Euler flows is presented. The number of techniques reported in literature is so large that a detailed description of all of them is out of scope. Therefore, this survey is concentrated to sketching only the more important numerical topics, and pointing out differences in possible approaches. The general approach to the numerical solution of the initial boundary value problem of the Euler equations consists of two major steps. In the first step the flow equations, the boundary conditions, and the initial conditions of the continuum-model formulation of the problem are replaced by a large system of algebraic equations (discretization). In the second step the resulting system of algebraic equations is solved (solution). The discretization process reduces to splitting the (t,x,y,z)-space into small elementary volumes called cells (grid generation), and writing down, for each cell, algebraic approximations of the conservation equations, of the initial conditions, and of boundary conditions. The solution of the algebraic equation system is discussed, and the topic of well-posedness of the numerical problem is briefly discussed. Author

N86-15260# Politecnico di Milano (Italy).
EXACT SOLUTIONS TO TRANSONIC AND SUPERSONIC FLOWS
G. Chiocchia *In* AGARD Test Cases for Inviscid Flow Field Methods May 1985 14 p refs (For primary document see N86-15256 06-02)
Avail: NTIS HC A15/MF A01

A survey of the most important analytical solutions for transonic and supersonic flows is presented. Particular attention is paid to the transonic cases, where the presence of embedded supersonic regions of a priori unknown extension causes considerable difficulties to the numerical computations and raises the need for reference test cases. Exact analytical transonic solutions are rare and not always adequate for checking practical cases. For this reason some approximate analytical solutions are also presented; in this case, however, the approximations must be well known in advance and their numerical effects must be limited. As a general standard of judgement, solutions in which the approximation consists in the replacement of partial differential equations by finite difference equations are excluded. Closed form or series solutions for two or three cases of approximate equations whose validity fields are well established are accepted. Author

N86-15261# National Aeronautical Establishment, Ottawa (Ontario).
REFERENCE TEST CASES AND CONTRIBUTORS
D. J. Jones *In* AGARD Test Cases for Inviscid Flow Field Methods May 1985 24 p refs (For primary document see N86-15256 06-02)
Avail: NTIS HC A15/MF A01

The reference test cases are divided into two sections. They are the two dimensional airfoils and cascades and three dimensional cases. Specifications, reference solutions, and contributors are given for the two dimensional cases. Specifications are divided into planform, profiles, root sections, and tip sections for the three dimensional cases. E.R.

N86-15262# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
NUMERICAL SOLUTIONS OF TWO-DIMENSIONAL REFERENCE TEST CASES
H. Viviand *In* AGARD Test Cases for Inviscid Flow Field Methods May 1985 68 p refs (For primary document see N86-15256 06-02)
Avail: NTIS HC A15/MF A01

Selected numerical solutions of the two dimensional reference test cases are presented and the quality if not the absolute accuracy of these solutions are assessed. The numerical methods used to solve the Euler equations are not taken into consideration in the present discussion, and the numerical solutions available for a given test case are evaluated essentially through cross-comparisons of these solutions and by taking into account some known features of the exact (unknown) solution. The present evaluation has shown the importance of the outer boundary position in relation with the boundary conditions and the numerical treatment applied at this boundary. It seems that the minimum distance at which this boundary should be located in order to achieve a given accuracy can vary to a very large extent depending on the boundary treatment. This is an important question which requires detailed studies of all the factors involved. Whereas the trailing edge problem and the Zierep singularity problem change in nature when viscous effects are taken into account, the problem of the far field treatment (outside the viscous wake) remains exactly the same at high Reynolds numbers. Author

N86-15263# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
NUMERICAL SOLUTIONS FOR THREE-DIMENSIONAL CASES: SWEPT WINGS
P. Sacher *In* AGARD Test Cases for Inviscid Flow Field Methods May 1985 110 p refs (For primary document see N86-15256 06-02)
Avail: NTIS HC A15/MF A01

The simplest swept wing geometry of practical interest was Test Case 11 and 12, ONERA M6, with constant section, moderate Aspect Ratio = 3.8 and only 30 deg leading edge sweep. But even this simple planform produced in TC11 with 3.06 deg angle of attack the rolling up of a Tip-Vortex which may contribute to induced drag. The numerical analysis of the nonlinear wake leaving the trailing edge of a lifting wing including the rolling up at the wing tips is one of the most promising aspects of the potential of solving the Euler equations at considerably higher cost in place of Full Potential equation. Consequently the complexity of a realistic transport type planform with twist, camber, variations of section profiles and breakpoints in leading and/or trailing edge sweep can be represented by Test Case 16, NASA AMES SWEPT WING. More or less, all additional problems in computation of the flow field are due to mesh-grid generation and the increase of the number of grid points which are necessary to simulate the flow sufficiently accurate. Only one contribution was obtained for this Test Case. Author

N86-15264# Royal Aircraft Establishment, Farnborough (England).
NUMERICAL SOLUTIONS FOR THREE-DIMENSIONAL CASES: DELTA WINGS
J. H. B. Smith *In* AGARD Test Cases for Inviscid Flow Field Methods May 1985 94 p refs (For primary document see N86-15256 06-02)
Avail: NTIS HC A15/MF A01

Wings of delta planform present the real problems of estimating wave drag and representing vortex flows in their simplest form. Any method of calculation aiming to contribute to these problems should be capable of performing well on such simple shapes. On the other hand, there is no evidence that reliable solutions for such simple shapes already exist. It was decided to seek solutions for wings of delta planform for conditions which are relevant to wave-drag estimation and vortex-flow prediction. For a shape which is reasonably slender, at a Mach number sufficiently greater than unity, the flow is supersonic everywhere, so that there is no upstream influence, and the flow can, in principle, be calculated by a space marching method. The final considerations affecting the choice of case are that the shape should be simple, and that experimental measurements should exist. The first makes it easy to ensure that the description of the shape is complete and unambiguous, and makes it possible for all potential computers to represent the shape in their programs. The second, while not strictly necessary and perhaps even irrelevant to the assessment of the accuracy of inviscid calculations, does provide an assurance that solutions judged to be mathematically accurate are not in serious conflict with physical reality. Author

N86-15265# Boeing Military Airplane Development, Seattle, Wash.
CONCLUDING REMARKS Abstract Only
H. Yoshara *In* AGARD Test Cases for Inviscid Flow Field Methods May 1985 1 p (For primary document see N86-15256 06-02)
Avail: NTIS HC A15/MF A01

It may be recalled that the primary purpose of the WG07 was the generation of relevant Euler solutions, both planar and 3D, to serve as Reference Test Cases which developers of Euler methods could use to assess their codes. Since such Reference Test Cases in most cases must themselves be generated numerically, there was initial concern as to the meaningfulness of this objective. The quality of the results produced by the many dedicated contributors has largely dispelled this concern. Except for a few instances, the numerical algorithms used by the contributors within the flow field and at the boundaries were sound. The relative accuracies of the various contributions were due in large part to the density and extent of the mesh used, though the quality of the artificial viscosity used was also an important factor. The planar airfoil solutions recommended herein should serve as reliable Reference Test Cases. The 3D cases understandably are relatively less reliable and must at present be considered as interim Test Cases to serve as approximate guides. It is hoped that the latter cases can be upgraded by future improved calculations. To monitor such activities as well as possibly to extent the scope to viscous solutions, the AGARD Fluid Dynamics Panel has established a Computational Fluid Dynamics Subcommittee. Author

N86-15266# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
AIRCRAFT DRAG PREDICTION AND REDUCTION
Loughton, England Jul. 1985 269 p refs Special course held in Rhode-Saint-Genese, Belgium, 20-23 May 1985 and in Hampton, Va., 5-8 Aug. 1985; sponsored by von Karman Inst. and AGARD (AGARD-R-723; ISBN-92-835-1507-2) Avail: NTIS HC A12/MF A01

Numerous topics relating to aircraft drag prediction and control are discussed. Laminar flow control with suction; parasitic and interference drag prediction and reduction; and vortex drag reduction are among the topics discussed. For individual titles, see N86-15267 through N86-15275.

N86-15267# Lockheed-Georgia Co., Marietta. Advanced Flight Sciences.
AIRCRAFT DRAG REDUCTION TECHNOLOGY: A SUMMARY
Andrew S. Thomas *In* AGARD Aircraft Drag Prediction and Reduction Jul. 1985 20 p refs Previously announced as N85-16782 (For primary document see N86-15266 06-02)
Avail: NTIS HC A12/MF A01

The current techniques of aircraft viscous drag reduction and some of the more recent developments that have taken place in this technology are reviewed. The various sources and relative contributions of aircraft drag are described including skin friction drag, pressure drag, interference drag and lift induced drag. The physical processes that lead to these drag contributions are emphasized and methods of reducing the impact of these drag sources are discussed. It is shown how innovative and optimized aircraft configurations can lead to drag benefits. E.A.K. (IAA)

N86-15268# Arizona State Univ., Tempe. Mechanical and Aerospace Engineering.
BOUNDARY-LAYER TRANSITION: T-S WAVES AND CROSSFLOW MECHANISMS
William S. Saric *In* AGARD Aircraft Drag Prediction and Reduction Jul. 1985 18 p refs (For primary document see N86-15266 06-02)
Avail: NTIS HC A12/MF A01

The basic instability mechanisms are discussed from an elementary standpoint considering only boundary layers in external flows. The current state-of-the-art of boundary-layer transition prediction is reviewed and, by using recent results, it is shown that a number of unique transition mechanisms exist and each can play a different role in the breakdown to turbulence. The control of the stability and transition characteristics of a particular flow field requires thoroughly understanding the details of these breakdown mechanisms. Author

N86-15269# Arizona State Univ., Tempe. Mechanical and Aerospace Engineering.
LAMINAR FLOW CONTROL WITH SUCTION: THEORY AND EXPERIMENT
William S. Saric *In* AGARD Aircraft Drag Prediction and Reduction Jul. 1985 11 p refs (For primary document see N86-15266 06-02)
Avail: NTIS HC A12/MF A01

The concept of boundary-layer stabilization with weak wall suction is introduced at a basic level and the means for calculating the effects of suction are described. The historical development of this technique is reviewed and the state-of-the-art of theory and experiment is covered. Some problems associated with the implementation of suction into aircraft boundary layers are discussed. Author

N86-15270*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DESIGN CONSIDERATIONS FOR APPLICATION OF LAMINAR FLOW CONTROL SYSTEMS TO TRANSPORT AIRCRAFT
Albert L. Braslow and Michael C. Fischer *In* AGARD Aircraft Drag Prediction and Reduction Jul. 1985 27 p refs (For primary document see N86-15266 06-02)
Avail: NTIS HC A12/MF A01 CSCL 01A

The current status of the laminar-flow control LFC technology is summarized. Factors that have previously inhibited the application of LFC are first reviewed. Involved are the effects of atmospheric ice crystals, surface irregularities, acoustical environment, and off-design operating conditions. Aircraft design trends that are different from turbulent aircraft are discussed as are various design requirements unique to the LFC systems. Current design approaches for the principal LFC systems are reviewed. These include the system for protection of the leading-edge region from surface contamination and icing and the system for removal of a portion of the boundary-layer air. The latter includes consideration of both multiple spanwise suction slots and distributed perforations and required differences between the wing-box and leading-edge box regions. Author

N86-15271*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TURBULENT DRAG REDUCTION FOR EXTERNAL FLOWS
D. M. Bushnell *In* AGARD Aircraft Drag Prediction and Reduction Jul. 1985 26 p refs (For primary document see N86-15266 06-02)
Avail: NTIS HC A12/MF A01

A summary of turbulent drag reduction approaches applicable to external flows is given. Because relatively recent and exhaustive reviews exist for laminar flow control and polymer (hydrodynamic) drag reduction, the focus here is upon the emerging areas of nonplanar geometry and large-eddy alteration. Turbulent control techniques for air generally result in modest (but technologically significant) drag reductions (order of 20 percent or less), whereas hydrodynamic approaches can yield drag reductions the order of 70 percent. Suggestions are included for alternative concepts and optimization of existing approaches. Author

N86-15272# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
PARASITIC AND INTERFERENCE DRAG PREDICTION AND REDUCTION
Ph. Poisson-Quinton *In* AGARD Aircraft Drag Prediction and Reduction Jul. 1985 27 p refs (For primary document see N86-15266 06-02)
Avail: NTIS HC A12/MF A01

Parasitic drag related to excrescences, leaks, etc., and to local flow separations, and interference drag related to wing/fuselage, propulsive nacelle/wing or fuselage, and external stores/wing or fuselage, etc., are discussed. Although a precise prediction of such drag terms is still difficult to obtain in wind-tunnel testing, a

large number of typical trends are available to the designer to avoid too large penalties on transport or combat aircraft at the preliminary design stage; several examples are given to illustrate these trends, together with some optimization methods. Author

N86-15273# Lockheed-Georgia Co., Marietta.
RECENT DEVELOPMENTS IN THREE-DIMENSIONAL WAKE ANALYSIS
J. E. Hackett and A. Sugavanam *In* AGARD Aircraft Drag Prediction and Reduction Jul. 1985 19 p refs (For primary document see N86-15266 06-02)
Avail: NTIS HC A12/MF A01

Significant advances in the determination of drag and its components (viscous, vortex, source, blockage, etc.) have been made in recent years. These were triggered by the reduction of the vortex drag integral to a wake integral by Maskell in the early 1970's. In 1979, Wu Hackett, and Lilley broadened the basis for Maskell's results and, in 1984, Hackett and Sugavanam devised methods which make it suitable for use in the near-wake of wind tunnel models. These advances are reviewed. A consistent derivation, starting from a simple form of the momentum equations, which include the best and least restrictive assumptions and procedures is provided. A practical example is discussed. Author

N86-15274# Royal Aircraft Establishment, Farnborough (England).
PREDICTION OF THE DRAG OF WINGS AT SUBSONIC SPEEDS BY VISCOUS/INVISCID INTERACTION TECHNIQUES
R. C. Lock *In* AGARD Aircraft Drag Prediction and Reduction Jul. 1985 71 p refs (For primary document see N86-15266 06-02)
Avail: NTIS HC A12/MF A01

Alternative ways of calculating the drag of an aerofoil or wing are discussed, and it is concluded that, at the present time, the far field approach is both more accurate and more informative. In this approach, the total drag is split into three components, wave (C sub D sub W), vortex (C sub D sub i) and viscous (C sub D sub V), and it is shown how simple methods for estimating these components can be derived. A brief account is given of the modern technique of viscous-inviscid interaction, concentrating on methods in which an accurate inviscid code is coupled with an integral method for calculating the viscous shear layers (boundary layer and wake). Recent advances are described which should improve the overall accuracy and allow more difficult cases, where boundary layer separation is present, to be treated successfully. Some methods of this type for aerofoils in two dimensions are summarized, and their accuracy assessed by comparison with experiment, including examples where flow separation takes place. Finally, an experiment on a particular wing-body combination, typical of a modern transport aircraft design, is chosen to show how an analysis of the drag can be performed by using the experimental pressure distribution as input to theoretical methods for calculating the separate wave, vortex and viscous components of drag.
Author

N86-15275# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Institut fuer Experimentelle Stroemungsmechnik.
TRANSONIC DRAG RISE AND DRAG REDUCTION BY ACTIVE/PASSIVE BOUNDARY LAYER CONTROL
E. Stanewsky and F. Krogmann *In* AGARD Aircraft Drag Prediction and Reduction Jul. 1985 41 p refs (For primary document see N86-15266 06-02)
Avail: NTIS HC A12/MF A01

Accurate drag prediction and efficient drag reduction are, particularly in the transonic speed range, paramount to the future of economical aircraft design and operation. The prediction of drag based on high-speed wind tunnel results are discussed with emphasis placed on problems associated with testing at transonic speeds and the transfer of low Reynolds number wind tunnel results to full-scale aircraft conditions. A more general consideration of the drag development associated with compressibility and viscosity and the viscous-inviscid interaction of the flow on an aerodynamic configuration is given. Drag reduction methods which are mainly based on active and passive boundary layer control by means of slots and perforated strips utilized to either draw material from and/or add material to the boundary layer are discussed. It may be concluded that present transonic drag predicton methods need further improvement, especially at off-design conditions; and that some of the approaches to boundary layer control considered may be quite efficient in increasing aircraft aerodynamic performance. Author

N86-15287*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LIFTING SURFACE THEORY FOR A HELICOPTER ROTOR IN FORWARD FLIGHT
H. Tai and Harry L. Runyan *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 89-101 refs Previously announced as N85-10916 (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01

N86-15288*# Hughes Helicopters, Culver City, Calif.
DEVELOPMENT OF AN UNSTEADY AERODYNAMICS MODEL TO IMPROVE CORRELATION OF COMPUTED BLADE STRESSES WITH TEST DATA
Santu T. Gangwani *In* NASA. Ames Research Center Rotorcraft Dynamics 11984 Nov. 1985 p 103-116 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01A

N86-15289*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AEROELASTIC CONSIDERATIONS FOR TORSIONALLY SOFT ROTORS
Wayne R. Mantay and William T. Yeager, Jr. *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 117-136 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01A

N86-15293*# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.
A REVIEW OF DYNAMIC INFLOW AND ITS EFFECT ON EXPERIMENTAL CORRELATIONS
Gopal H. Gaonkar and David A. Peters (Washington Univ., St. Louis, Mo.) *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 187-205 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01A

N86-15298*# Howard Univ., Washington, D. C.
DYNAMIC RESPONSE CHARACTERISTICS OF A CIRCULATION CONTROL ROTOR MODEL PNEUMATIC SYSTEM
Charles B. Watkins, Kenneth R. Reader (Naval Ship Research and Development Center, Bethesda, Md.), and Subash K. Dutta *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 273-285 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01B

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N86-15276# National Transportation Safety Board, Washington, D. C. Bureau of Accident Investigation.
AIRCRAFT ACCIDENT REPORT: VIEQUES AIR LINK, INC., BRITTEN-NORMAN BN-21-6 ISLANDER, N589SA, VIEQUES, PUERTO RICO, AUGUST 2, 1984
27 Sep. 1985 51 p
(PB85-901408; NTSB/AAR-85/08) Avail: NTIS HC A04/MF A01

About 0805 Atlantic standard time on August 2, 1984, Vieques Air Link, Inc., Flight 901A, a Britten-Norman BN-2A-6 Islander, crashed into the ocean shortly after takeoff from Vieques, Puerto Rico. Flight 901A was operated from Vieques, Puerto Rico, to St. Croix, U.S. Virgin Islands. The pilot and his eight passengers were killed, and the airplane was destroyed on impact with the water. The left engine lost power shortly after takeoff and the pilot lost control of the airplane. The National Transportation Safety Board determines that the probable cause of the accident was the failure of the pilot to execute the emergency engine-out procedure properly shortly after takeoff following a loss of power in the left engine due to water in the airplane's fuel system, and the failure of the Puerto Rico Ports Authority to remove excess water known to be in the airport's in-ground fuel tank before conducting fueling operations. The pilot's failure to execute the engine-out procedure properly was due to his inexperience in multi-engine airplanes. Contributing to the accident were: (1) the air carrier's use of a pilot not certified for the flight; (2) the air carrier's failure to train the pilot adequately; (3) the pilot's failure to follow proper practices to detect water in the airplane's fuel tanks; (4) the out of weight and balance condition of the airplane; (5) the Federal Aviation Administration's (FAA) incorrect application of 14 CFR Part 135 Rules to commuter air carriers; and (6) the FAA's generally inadequate surveillance of the air carrier. Author

N86-15277# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
THREE-AXIS ELECTROFLUIDIC ANGULAR RATE SENSOR FOR EJECTION SEAT STEERING THRUST VECTOR CONTROL Final Report
V. Nuyen 2 Oct. 1984 166 p
(F41-400; F41-451)
(AD-A159413; NADC-85053-60) Avail: NTIS HC A08/MF A01 CSCL 17/7

Three-axis electrofluidic rate sensors were fabricated to NAVAIRDEVCEN specifications by the Hamilton Standard Division of United Technologies. Three units were delivered for test and evaluation. These units met or exceeded all but one of the performance goals specified for the maximum performance ejection system. This exception was a 119 millisecond (ms) ready time instead of the 100 ms goal. The other important performance characteristics include the linear range of + or -700 deg/sec, a transport delay at 5 ms, and the capability to operate during and after an ejection acceleration profile which peaked at 12.3 g. These units are suitable for use in the thrust vector control system of an advanced escape system. They are ready for system integration and full system performance testing. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N86-15278*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
A FAULT TOLERANT SYSTEM FOR AN INTEGRATED AVIONICS SENSOR CONFIGURATION Final Report
Alper K. Caglayan and Roy E. Lancraft Sep. 1984 191 p refs (Contract NAS1-16579)
(NASA-CR-3834; NAS 1.26:3834; BBN-5352) Avail: NTIS HC A09/MF A01 CSCL 01D

An aircraft sensor fault tolerant system methodology for the Transport Systems Research Vehicle in a Microwave Landing System (MLS) environment is described. The fault tolerant system provides reliable estimates in the presence of possible failures both in ground-based navigation aids, and in on-board flight control and inertial sensors. Sensor failures are identified by utilizing the analytic relationships between the various sensors arising from the aircraft point mass equations of motion. The estimation and failure detection performance of the software implementation (called FINDS) of the developed system was analyzed on a nonlinear digital simulation of the research aircraft. Simulation results showing the detection performance of FINDS, using a dual redundant sensor compliment, are presented for bias, hardover, null, ramp, increased noise and scale factor failures. In general, the results show that FINDS can distinguish between normal operating sensor errors and failures while providing an excellent detection speed for bias failures in the MLS, indicated airspeed, attitude and radar altimeter sensors. Author

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N86-15279# Aeronautical Research Labs., Melbourne (Australia).
AN OPTIMISATION METHOD FOR RECONSTRUCTION OF FLIGHT PATH TRAJECTORIES FROM NON-SYNCHRONOUS TIME-SAMPLED OBSERVATIONS BY TWO CINE CAMERAS
A. Ross, L. Mockridge, and D. Drumm Oct. 1984 68 p ref
(ARL-SYS-R-34; AR-003-969) Avail: NTIS HC A04/MF A01

Helicopter flight path trajectories in approach to a tactical landing aid were monitored, ad hoc, by two cine cameras. Post-trial trajectory reconstruction using simple triangulation methods was confounded by the presence of an unknown bias error in the orientation of one camera, and by nonsynchronous camera timing. The report describes the concept, formulation and implementation of an optimization method which pools all data for a trajectory, permits extraction of bias terms, and yields a complete trajectory smoothed in space and time. Author

N86-15280*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ROTORCRAFT DYNAMICS 1984
Nov. 1985 497 p refs Proceedings of the 2d Decennial Specialists' Meeting on Rotorcraft Dynamics, Moffett Field, Calif., 7-9 Nov. 1984; sponsored by NASA. Ames Research Center and the American Helicopter Society
(NASA-CP-2400; Rept-85122; NAS 1.55:2400) Avail: NTIS HC A21/MF A01 CSCL 01C

In the conference proceedings are 24 presented papers, their discussions, and material given in two panels. The presented papers address the general areas of the dynamics of rotorcraft or helicopters. Specific topics include the stability of rotors in hover and forward flight, the stability of coupled rotor-fuselage systems in hover, the loads on a rotor in forward flight including new developments in rotor loads calculations, and the calculation of rotorcraft vibration and means for its control or suppression. Material in the first panel deals with the successful application of dynamics technology to engineering development of flight vehicles. Material in the second panel is concerned with large data bases in the area of rotorocraft dynamics and how they are developed, managed, and used. For individual titles, see N86-15281 through N86-15304.

N86-15281*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE USE OF ACTIVE CONTROLS TO AUGMENT ROTOR/FUSELAGE STABILITY c08
Friedrich K. Straub (Hughes Helicopters, Inc., Culver City, Calif.) and William Warmbrodt *In its* Rotorcraft Dynamics 1984 Nov. 1985 p 1-15 refs Previously announced in IAA as A85-43220
(For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

The use of active blade pitch control to increase helicopter rotor/body damping is studied. Control is introduced through a

conventional nonrotating swashplate. State variable feedback of rotor and body states is used. Feedback parameters include cyclic rotor flap and lead-lag states, and body pitch and roll rotations. The use of position, rate, and acceleration feedback is studied for the various state variables. In particular, the influence of the closed loop feedback gain and phase on system stability is investigated. For the rotor/body configuration analyzed, rotor cyclic inplane motion and body roll-rate and roll-acceleration feedback can considerably augment system damping levels and eliminate ground resonance instabilities. Scheduling of the feedback state, phase, and gain with rotor rotation speed can be used to maximize the damping augmentation. This increase in lead-lag damping can be accomplished without altering any of the system modal frequencies. Investigating various rotor design parameters (effective hinge offset, blade precone, blade flap stiffness) indicates that active control for augmenting rotor/body damping will be particularly powerful for hingeless and bearingless rotor hubs. Author

N86-15282*# Kaman Aerospace Corp., Bloomfield, Conn.
GROUND RESONANCE ANALYSIS USING A SUBSTRUCTURE MODELING APPROACH **c08**
Shyi-Yaung Chen, Edward E. Austin (Applied Technology Lab., Fort Eustis, Va.), and Alex Berman *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 16-26 (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

A convenient and versatile procedure for modeling and analyzing ground resonance phenomena is described and illustrated. A computer program is used which dynamically couples differential equations with nonlinear and time dependent coefficients. Each set of differential equations may represent a component such as a rotor, fuselage, landing gear, or a failed damper. Arbitrary combinations of such components may be formulated into a model of a system. When the coupled equations are formed, a procedure is executed which uses a Floquet analysis to determine the stability of the system. Illustrations of the use of the procedures along with the numerical examples are presented. Author

N86-15283*# Boeing Vertol Co., Philadelphia, Pa.
PARAMETRIC STUDY OF THE AEROELASTIC STABILITY OF A BEARINGLESS ROTOR **c08**
W. Euan Hooper *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 27-43 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

A trade study was conducted to illustrate the sensitivity of the aeroelastic stability of a bearingless main rotor to the rotor hub coupling parameters that are available for the designer. The results are presented over the complete range of rotor speed and collective pitch available and the effects on air resonance of the 6 beam installation angles are compared together with the results of offsetting the cuff snubber attachment. The major part of the study was conducted using the FLAIR analysis which incorporates a uniform representation of the flexbeam. Results are also shown for a modified version of FLAIR in which the uniform beam is replaced by a member having the geometric tailoring resulting from structural optimization. Author

N86-15284*# Duke Univ., Durham, N. C. Dept. of Mechanical Engineering and Material Science.
NONLINEAR DYNAMICS OF A HELICOPTER MODEL IN GROUND RESONANCE **c08**
D. M. Tang and E. H. Dowell *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 45-55 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

An approximate theoretical method is presented which determined the limit cycle behavior of a helicopter model which has one or two nonlinear dampers. The relationship during unstable ground resonance oscillations between lagging motion of the blades and fuselage motion is discussed. An experiment was carried out on using a helicopter scale model. The experimental results agree with those of the theoretical analysis. Author

N86-15285*# Sikorsky Aircraft, Stratford, Conn.
TEST RESULTS FROM A DYNAMIC MODEL DYNAFLEX ROTOR
Charles F. Niebanck and Robert K. Goodman *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 57-68 ref (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

A one-fifth scale dynamic model of the Sikorsky Dynaflex rotor was tested in hover and in forward flight conditions in a wind tunnel. The Dynaflex rotor features an advanced composite structure which flexes to provide a constant speed universal joint action. Testing concentrated on confirming that the stability and dynamic response of the rotor were satisfactory. Lift conditions of up to .11 Ct/sigma and advance ratios as high as .46 were reached. Vibratory loads were compared to those of articulated rotors. The Dynaflex rotor concept appears to be a practical concept from the standpoint of dynamic response and stability. Author

N86-15286*# Army Aviation Systems Command, Moffett Field, Calif. Aeromechanics Lab.
EXPERIMENTALLY DETERMINED FLUTTER FROM TWO- AND THREE-BLADED MODEL BEARINGLESS ROTORS IN HOVER **c08**
William G. Bousman and Seth Dawson *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 69-88 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

A series of experiments was performed on a 1.8-m-diam model rotor in hover for the principal purpose of investigating the lead-lag stability of isolated bearingless rotors. Incidental to those tests, at least three types of pitch-flap flutter were encountered. Type 1 flutter occurred approximately at the second flap-mode frequency on both two-and three-bladed rotors for both small and large pitch angles and appeared to be a classic pitch-flap flutter. Type 2 flutter showed mostly torsional motion and was seen on both two- and three-bladed rotors. Type 3 flutter was a regressing flap flutter that occurred for only the three-bladed rotor configurations and appears to be a wake excited flutter. Although flutter occurred on a number of different configurations, no rotor parameters were identified that were clearly stabilizing or destabilizing. Author

N86-15287*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LIFTING SURFACE THEORY FOR A HELICOPTER ROTOR IN FORWARD FLIGHT **c02**
H. Tai and Harry L. Runyan *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 89-101 refs Previously announced as N85-10916 (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01

A lifting surface theory was developed for a helicopter rotor in forward flight for compressible and incompressible flow. The method utilizes the concept of the linearized acceleration potential and makes use of the vortex lattice procedure. Calculations demonstrating the application of the method are given in terms of the lift distribution on a single rotor, a two-bladed rotor, and a rotor with swept-forward and swept-back tips. In addition, the lift on a rotor which is vibrating in a pitching mode at 4/rev is given. Compressibility effects and interference effects for a two-bladed rotor are discussed. Author

N86-15288*# Hughes Helicopters, Culver City, Calif.
DEVELOPMENT OF AN UNSTEADY AERODYNAMICS MODEL TO IMPROVE CORRELATION OF COMPUTED BLADE STRESSES WITH TEST DATA **c02**
Santu T. Gangwani *In* NASA. Ames Research Center Rotorcraft Dynamics 11984 Nov. 1985 p 103-116 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01A

A reliable rotor aeroelastic analysis operational that correctly

predicts the vibration levels for a helicopter is utilized to test various unsteady aerodynamics models with the objective of improving the correlation between test and theory. This analysis called Rotor Aeroelastic Vibration (RAVIB) computer program is based on a frequency domain forced response analysis which utilizes the transfer matrix techniques to model helicopter/rotor dynamic systems of varying degrees of complexity. The results for the AH-1G helicopter rotor were compared with the flight test data during high speed operation and they indicated a reasonably good correlation for the beamwise and chordwise blade bending moments, but for torsional moments the correlation was poor. As a result, a new aerodynamics model based on unstalled synthesized data derived from the large amplitude oscillating airfoil experiments was developed and tested. Author

N86-15289*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AEROELASTIC CONSIDERATIONS FOR TORSIONALLY SOFT ROTORS **c02**
Wayne R. Mantay and William T. Yeager, Jr. *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 117-136 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01A

A research study was initiated to systematically determine the impact of selected blade tip geometric parameters on conformable rotor performance and loads characteristics. The model articulated rotors included baseline and torsionally soft blades with interchangeable tips. Seven blade tip designs were evaluated on the baseline rotor and six tip designs were tested on the torsionally soft blades. The designs incorporated a systemmatic variation in geometric parameters including sweep, taper, and anhedral. The rotors were evaluated in the NASA Langley Transonic Dynamics Tunnel at several advance ratios, lift and propulsive force values, and tip Mach numbers. A track sensitivity study was also conducted at several advance ratios for both rotors. Based on the test results, tip parameter variations generated significant rotor performance and loads differences for both baseline and torsionally soft blades. Author

N86-15290*# Kaman Aerospace Corp., Bloomfield, Conn.
OPTIMAL DESIGN APPLICATION ON THE ADVANCED AEROELASTIC ROTOR BLADE
Fu-Shang Wei and Robert Jones *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 137-151 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

The vibration and performance optimization procedure using regression analysis was successfully applied to an advanced aeroelastic blade design study. The major advantage of this regression technique is that multiple optimizations can be performed to evaluate the effects of various objective functions and constraint functions. The data bases obtained from the rotorcraft flight simulation program C81 and Myklestad mode shape program are analytically determined as a function of each design variable. This approach has been verified for various blade radial ballast weight locations and blade planforms. This method can also be utilized to ascertain the effect of a particular cost function which is composed of several objective functions with different weighting factors for various mission requirements without any additional effort. Author

N86-15291*# Sikorsky Aircraft, Stratford, Conn. Dynamics Methods.
DEVELOPMENT AND APPLICATION OF A TIME-HISTORY ANALYSIS FOR ROTORCRAFT DYNAMICS BASED ON A COMPONENT APPROACH
Robert Sopher and Daniel W. Hallock *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 153-169 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

A time history analysis for rotorcraft dynamics based on dynamical substructures, and nonstructural mathematical and aerodynamic components is described. The analysis is applied to predict helicopter ground resonance and response to rotor damage. Other applications illustrate the stability and steady vibratory response of stopped and gimballed rotors, representative of new technology. Desirable attributes expected from modern codes are realized, although the analysis does not employ a complete set of techniques identified for advanced software. The analysis is able to handle a comprehensive set of steady state and stability problems with a small library of components. Author

N86-15292*# Boeing Vertol Co., Philadelphia, Pa.
RESTRUCTURING THE ROTOR ANALYSIS PROGRAM C-60
In NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 171-185 (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

The continuing evolution of the rotary wing industry demands increasing analytical capabilities. To keep up with this demand, software must be structured to accommodate change. The approach discussed for meeting this demand is to restructure an existing analysis. The motivational factors, basic principles, application techniques, and practical lessons from experience with this restructuring effort are reviewed. Author

N86-15293*# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.
A REVIEW OF DYNAMIC INFLOW AND ITS EFFECT ON EXPERIMENTAL CORRELATIONS **c02**
Gopal H. Gaonkar and David A. Peters (Washington Univ., St. Louis, Mo.) *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 187-205 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01A

A review is given of the relationship between experimental data and the development of modern dynamic-inflow theory. Some of the most interesting data, first presented 10 years ago at the Dynamic Specialist's Meeting, is now reviewed in light of the newer theories. These pure blade-flapping data correlate very well with analyses that include the new dynamic inflow theory, thus verifying the theory. Experimental data are also presented for damping with coupled inplane and body motions. Although inclusion of dynamic inflow is often required to correlate this coupled data, the data cannot be used to verify any particular dynamic inflow theory due to the uncertainties in modeling the inplane degree of freedom. For verification, pure flapping is required. However, the coupled data do show that inflow is often important in such computations. Author

N86-15294*# California Univ., Los Angeles. Dept. of Mechanical, Aerospace and Nuclear Engineering.
INFLUENCE OF VARIOUS UNSTEADY AERODYNAMIC MODELS ON THE AEROMECHANICAL STABILITY OF A HELICOPTER IN GROUND RESONANCE **c08**
P. P. Friedmann and C. Venkatesan *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 207-219 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

The aeromechanical stability of a helicopter in ground resonance was analyzed, by incorporating five different aerodynamic models in the coupled rotor/fuselage analysis. The sensitivity of the results to changes in aerodynamic modelling was carefully examined. The theoretical results were compared with experimental data and useful conclusions are drawn regarding the role of aerodynamic modeling on this aeromechanical stability problem. The aerodynamic model which provided the best all around correlation with the experimental data was identified. Author

N86-15295*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE INFLUENCE OF DYNAMIC INFLOW AND TORSIONAL FLEXIBILITY ON ROTOR DAMPING IN FORWARD FLIGHT FROM SYMBOLICALLY GENERATED EQUATIONS **c08**
T. S. R. Reddy and William Warmbrodt *In its* Rotorcraft Dynamics 1984 Nov. 1985 p 221-240 refs (For primary document see

N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

The combined effects of blade torsion and dynamic inflow on the aeroelastic stability of an elastic rotor blade in forward flight are studied. The governing sets of equations of motion (fully nonlinear, linearized, and multiblade equations) used in this study are derived symbolically using a program written in FORTRAN. Stability results are presented for different structural models with and without dynamic inflow. A combination of symbolic and numerical programs at the proper stage in the derivation process makes the obtainment of final stability results an efficient and straightforward procedure. B.W.

N86-15296*# Maryland Univ., College Park. Center for Rotorcraft Education and Research.
FLAP-LAG-TORSION STABILITY IN FORWARD FLIGHT c08
Brahmananda Panda and Inderjit Chopra *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 241-258 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

An aeroelastic stability of three-degree flap-lag-torsion blade in forward flight is examined. Quasisteady aerodynamics with a dynamic inflow model is used. The nonlinear time dependent periodic blade response is calculated using an iterative procedure based on Floquet theory. The periodic perturbation equations are solved for stability using Floquet transition matrix theory as well as constant coefficient approximation in the fixed reference frame. Results are presented for both stiff-inplane and soft-inplane blade configurations. The effects of several parameters on blade stability are examined, including structural coupling, pitch-flap and pitch-lag coupling, torsion stiffness, steady inflow distribution, dynamic inflow, blade response solution and constant coefficient approximation. Author

N86-15297*# Maryland Univ., College Park. Center for Rotorcraft Education and Research.
DYNAMIC STABILITY OF A BEARINGLESS CIRCULATION CONTROL ROTOR BLADE IN HOVER c08
Inderjit Chopra *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 259-271 (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

The aeroelastic stability of flap bending, lead-lag bending and torsion of a bearingless circulation control rotor blade in hover is investigated using a finite element formulation based on Hamilton's principle. The flexbeam, the torque tube and the outboard blade are discretized into beam elements, each with fifteen nodal degrees of freedom. Quasisteady strip theory is used to evaluate the aerodynamic forces and the airfoil characteristics are represented either in the form of simple analytical expressions or in the form of data tables. A correlation study of analytical results with the experimental data is attempted for selected bearingless blade configurations with conventional airfoil characteristics. B.W.

N86-15298*# Howard Univ., Washington, D. C.
DYNAMIC RESPONSE CHARACTERISTICS OF A CIRCULATION CONTROL ROTOR MODEL PNEUMATIC SYSTEM c02
Charles B. Watkins, Kenneth R. Reader (Naval Ship Research and Development Center, Bethesda, Md.), and Subash K. Dutta *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 273-285 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01B

Numerical and experimental simulation of unsteady airflow through the control valve and slotted air duct of a circulation control rotor is described. The numerical analysis involves the solution of the quasi-one-dimensional compressible fluid-dynamic equations in the blade air duct together with the coupled isentropic flow equations for flow into the blade through the valve and out of the blade through the Coanda slot. Numerical solutions are compared with basic experimental results obtained for a mockup of a circulation control rotor and its pneumatic valving system. The pneumodynamic phenomena that were observed are discussed with particular emphasis on the characteristic system time lags associated with the response of the flow variables to transient and periodic control valve inputs. Author

N86-15299*# Sikorsky Aircraft, Stratford, Conn.
AN EXAMINATION OF THE RELATIONS BETWEEN ROTOR VIBRATORY LOADS AND AIRFRAME VIBRATIONS c08
Charles F. Niebanck *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 287-305 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

Harmonic rotor hub loads and airframe interactions in steady flight are reviewed, with regard to the objective of achieving lower airframe vibration by modifying blade root loads. Flight test and wind tunnel data are reviewed, along with sample fuselage response data. Trends which could provide a generalized approach to the above objective are found to be very limited. Recent analytical and corresponding experimental blade tuning modifications are reviewed and compared. Rotor vibratory load modification and substantial vibration changes were achieved over a wide range of rotor operating conditions. B.W.

N86-15300*# Boeing Vertol Co., Philadelphia, Pa.
PLANNING, CREATING AND DOCUMENTING A NASTRAN FINITE ELEMENT MODEL OF A MODERN HELICOPTER c39
R. Gabal, D. Reed, R. Ricks, and W. Kesack *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 307-324 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 20K

Mathematical models based on the finite element method of structural analysis as embodied in the NASTRAN computer code are widely used by the helicopter industry to calculate static internal loads and vibration of airframe structure. The internal loads are routinely used for sizing structural members. The vibration predictions are not yet relied on during design. NASA's Langley Research Center sponsored a program to conduct an application of the finite element method with emphasis on predicting structural vibration. The Army/Boeing CH-47D helicopter was used as the modeling subject. The objective was to engender the needed trust in vibration predictions using these models and establish a body of modeling guides which would enable confident future prediction of airframe vibration as part of the regular design process. Author

N86-15301*# Washington Univ., St. Louis, Mo. Dept. of Mechanical Engineering.
COUPLED ROTOR-BODY VIBRATIONS WITH INPLANE DEGREES OF FREEDOM c08
Huang Ming-Sheng and David A. Peters *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 325-341 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

In an effort to understand the vibration mechanisms of helicopters, the following basic studies are considered. A coupled rotor-fuselage vibration analysis including inplane degrees of freedom of both rotor and airframe is performed by matching of rotor and fuselage impedances at the hub. A rigid blade model including hub motion is used to set up the rotor flaplag equations. For the airframe, 9 degrees of freedom and hub offsets are used. The equations are solved by harmonic balance. For a 4-bladed rotor, the coupled responses and hub loads are calculated for various parameters in forward flight. The results show that the addition of inplane degrees of freedom does not significantly affect the vertical vibrations for the cases considered, and that inplane vibrations have similar resonance trends as do flapping vibrations. Author

N86-15302*# United Technologies Research Center, East Hartford, Conn. Aeromechanics Research.
ANALYSIS OF POTENTIAL HELICOPTER VIBRATION REDUCTION CONCEPTS c08
Anton J. Landgrebe and Mark W. Davis *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 243-363 refs (For primary document see N86-15280 06-05)

Avail: NTIS HC A21/MF A01 CSCL 01C

Results of analytical investigations to develop, understand, and evaluate potential helicopter vibration reduction concepts are presented in the following areas: identification of the fundamental sources of vibratory loads, blade design for low vibration, application of design optimization techniques, active higher harmonic control, blade appended aeromechanical devices, and the prediction of vibratory airloads. Primary sources of vibration are identified for a selected four-bladed articulated rotor operating in high speed level flight. The application of analytical design procedures and optimization techniques are shown to have the potential for establishing reduced vibration blade designs through variations in blade mass and stiffness distributions, and chordwise center-of-gravity location. B.W.

N86-15303*# Sikorsky Aircraft, Stratford, Conn.

ADAPTATION OF A MODERN MEDIUM HELICOPTER (SIKORSKY S-76) TO HIGHER HARMONIC CONTROL c08

James J. OLeary, Sesi B. R. Kottapalli, and Mark W. Davis *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 365-378 refs (For primary document see N86-15280 06-05)

Avail: NTIS HC A21/MF A01 CSCL 01C

Sikorsky Aircraft has performed analytical studies, design analyses, and risk reduction tests have been performed for Higher Harmonic Control (HHC) on the S-76. The S-76 is an 8 to 10,000 lb helicopter which cruises at 145 kts. Flight test hardware has been assembled, main servo frequency response tested and upgraded, aircraft control system shake tested and verified, open loop controllers designed and fabricated, closed loop controllers defined and evaluated, and rotors turning ground and flight tests planned for the near future. Open loop analysis shows that about 2 deg of higher harmonic feathering at the blade 75% radius will be required to eliminate 4P vibration in the cockpit. B.W.

N86-15304*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

EVALUATION OF A LOAD CELL MODEL FOR DYNAMIC CALIBRATION OF THE ROTOR SYSTEMS RESEARCH AIRCRAFT

R. W. DuVal (Advanced Rotorcraft Technology, Inc., Los Altos, Calif.), H. Bahrami, and B. Wellman *In its* Rotorcraft Dynamics 1984 Nov. 1985 p 379-393 refs (For primary document see N86-15280 06-05)

Avail: NTIS HC A21/MF A01 CSCL 01C

The Rotor Systems Research Aircraft uses load cells to isolate the rotor/transmission system from the fuselage. An analytical model of the relationship between applied rotor loads and the resulting load cell measurements is derived by applying a force-and-moment balance to the isolated rotor/transmission system. The model is then used to estimate the applied loads from measured load cell data, as obtained from a ground-based shake test. Using nominal design values for the parameters, the estimation errors, for the case of lateral forcing, were shown to be on the order of the sensor measurement noise in all but the roll axis. An unmodeled external load appears to be the source of the error in this axis. Author

N86-15305*# Boeing Commercial Airplane Co., Seattle, Wash.

F-111 NATURAL LAMINAR FLOW GLOVE FLIGHT TEST DATA ANALYSIS AND BOUNDARY LAYER STABILITY ANALYSIS Contractor Report, Aug. 1981 - Jul. 1983

L. James Runyan, Brent H. Navran, and Rodger A. Rozendaal Jan. 1984 224 p refs

(Contract NAS1-15325)

(NASA-CR-166051; NAS 1.26:166051; D6-51153) Avail: NTIS HC A10/MF A01 CSCL 01C

An analysis of 34 selected flight test data cases from a NASA flight program incorporating a natural laminar flow airfoil into partial wing gloves on the F-111 TACT airplane is given. This analysis determined the measured location of transition from laminar to turbulent flow. The report also contains the results of a boundary layer stability analysis of 25 of the selected cases in which the crossflow (C-F) and Tollmien-Schlichting (T-S) disturbance amplification factors are correlated with the measured transition location. The chord Reynolds numbers for these cases ranges from about 23 million to 29 million, the Mach numbers ranged from 0.80 to 0.85, and the glove leading-edge sweep angles ranged from 9 deg to 25 deg. Results indicate that the maximum extent of laminar flow varies from 56% chord to 9-deg sweep on the upper surface, and from 51% chord at 16-deg sweep to 6% chord at 25-deg sweep on the lower. The results of the boundary layer stability analysis indicate that when both C-F and T-S disturbances are amplified, an interaction takes place which reduces the maximum amplification factor of either type of disturbance that can be tolerated without causing transition. Author

N86-15306# Army Training and Doctrine Command, Fort Monroe, Va.

LIGHT HELICOPTER FAMILY TRADE-OFF ANALYSIS. VOLUME 4: APPENDIX N Final Report

R. Fico, J. Wallace, B. Simpson, and N. H. Cleek 15 May 1985 452 p

(AD-A158075; AD-F630692) Avail: NTIS HC A20/MF A01 CSCL 01/3

During the Light Helicopter Family (LHX) Trade-Off Analysis (TOA), 10 major areas of aircraft performance and subsystems were evaluated. These 10 substudies formed the following Annexes: (1) light helicopter family (LHX) subsystems; (2) structures- pertinent issues and systems characteristics; (3) LHX deployability; (4) vertical flight analysis; (5) maneuverability/agility analysis; (6) level flight analysis speed; (7) level flight analysis - cruise efficiency; (8) level flight analysis - one engine inoperative (OEI); (9) multiple attribute decision making analysis; and (10) aircraft performance and engine power margin. These substudies with a summary formed this volume of the LHX TOA Report. GRA

N86-15307# Army Training and Doctrine Command, Fort Monroe, Va.

LIGHT HELICOPTER FAMILY TRADE-OFF ANALYSIS. VOLUME 7: APPENDIX R Final Report

P. W. Hickman, R. N. Armstrong, and N. H. Cleek 15 May 1985 613 p

(AD-A158076; AD-F630692) Avail: NTIS HC A99/MF A01 CSCL 01/3

Thirteen subanalyses were performed and reported in Annexes found within this HF/MMI volume. Their titles follow and are fairly descriptive of both the substudy's emphasis and contents: (1) projective application of the subjective workload assessment technique to advance helicopter crew system designs; (2) human factors engineering review of the integrated crewstation for the LHX; (3) tactical implications of one-man versus two-man aircrews for the LHX; (4) a computer analysis to predict crew workload during LHX scout-attack missions; (5) visually coupled airborne systems simulator (VCASS) LHX cockpit simulation; (6) human factors assessment of voice technology of the LHX cockpit simulation; (7) issues for a trade-off analysis of conventional; versus advanced cockpit controllers for the LHX; (8) biomedical analysis of visual displays and cockpit design options for the LHX; (9) NBC contamination protection, detection, and decontamination concepts analysis for the LHX; (10) humman factors engineering assessment of navigation systems for the LHX; (11) the integration of voice and visual displays for aviation systems; (12) theory and measurement of human workload; and (13) pilot workload, performance, and aircraft control automation. GRA

N86-15308# Army Training and Doctrine Command, Fort Monroe, Va.

LIGHT HELICOPTER FAMILY TRADE-OFF ANALYSIS. VOLUME 8: APPENDICES S AND T Final Report

E. M. Berta, F. C. Sautter, M. Sykes, N. H. Cleek, and R. Flynn 15 May 1985 167 p

(AD-A158077; AD-F630692) Avail: NTIS HC A08/MF A01 CSCL 01/3

This volume of the light helicopter family (LHX) trade-off analysis (TOA) report contains the reports of two separate but

related analyses. The first is the force structure analysis that identifies the foreseeable impact of the LHX on the Army's aircraft and manpower requirements. The study concludes that: (1) the total LHX force structure requirements are: (a) LHX-SCAT - 3,072 aircraft; and (b) LHX-Utility - 1,951 aircraft; and (2) depending on LHX candidate, maintenance personnel savings of 8 to 10% are achievable. The second analysis is of reliability, availability, and maintainability/logistics (RAM/LOG). The RAM/LOG analysis intended to identify and quantify the minimum values of RAM and associated supportability goals that the LHX would need to achieve. The RAM/LOG findings/conclusions included: (1) optimum unit size: (a) 11 aircraft per attack helicopter battalion company; and (b) 10 aircraft per aviation reconnaissance squadron troop; (2) 5.7 to 5.8 aircraft flying hours per aircraft per day are the objective flight program; (3) 1.0-hour mean time to repair; (4) 3.6-maintenance man-hours/flight hour maintenance ratio; and (5) 7.1 to 8.7 hours mean time between mission about failure (minimum acceptable value). GRA

N86-15309# Army Training and Doctrine Command, Fort Monroe, Va.
LIGHT HELICOPTER FAMILY TRADE-OFF ANALYSIS. VOLUME 10: APPENDICES V, W, X, AND Z Final Report
B. Roberts, J. Parrish, B. J. Watts, N. H. Cleek, and P. Hickman 15 May 1985 194 p
(AD-A158079; AD-F630692) Avail: NTIS HC A09/MF A01 CSCL 01/3

This volume of the light helicopter family (LHX) trade-off analysis (TOA) report gives the details of four substudies done within the TOA. These substudy areas were: safety, cost, commonality, and downwash. The findings/conclusions reached by the Safety Analysis included: (1) the LHX should be planned for two crewmembers; (2) the LHX should be designed with two engines; (3) these important safety design features should be included in the LHX: (a) twin engines with an OEI flight capability; (b) effective antitorque control under all mission flight environments; (c) no tail rotor or a high degree of protection for the tail rotor; (d) visionics system for use during reduced visibility conditions; (e) wire strike protection system (WSPS); (f) backup or redundant flight control system; (g) wheeled landing gear; (h) rigid or redundant flight control system; (i) maintenance and flight data recorders; (j) performance planning computer; and (k) automated systems to reduce pilot workload; and (4) the following crashworthiness items are important and should be features of the LHX: (a) crashworthy fuel systems; (b) high mass item retention; (c) high-energy absorption gear (fixed or automatic extension) and fuselage; (d) crew seat and restraint system; (e) troop seat and restraint system; (f) noninjurious cockpit environment; and (g) emergency locator transmitter (ELT). GRA

N86-15310# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
AIRCRAFT FLIGHT PERFORMANCE METHODS. REVISION 2 Final Report, Jun. 1974 - Jul. 1975
L. E. Miller and P. G. Koch Jul. 1985 284 p
(DA Proj. 136-6)
(AD-A158227; AFFDL-TR-75-89-Rev-2) Avail: NTIS HC A13/MF A01 CSCL 01/2

This report addresses the problems associated with the derivation of aircraft performance characteristics. The emphasis is on segments which are a part of a mission profile. In particular, the following areas are studied; takeoff, climb, cruise, descent and glide, turning, and landing. The generalized approach to performance estimates is first presented. Next, appropriate solutions are derived. Last sensitivity relationships are developed. The relationships determine changes in the performance characteristics as a result of an aircraft configuration change. This permits rapid evaluation of the performance variations for any segment of a mission profile. GRA

N86-15311# Center for Naval Analyses, Alexandria, Va. Naval Planning Manpower and Logistics Div.
THE RELATIONSHIP BETWEEN MATERIAL FAILURES AND FLIGHT HOURS: STATISTICAL CONSIDERATIONS
M. S. Goldberg Jan. 1985 22 p
(Contract N00014-83-C-0725)
(AD-A159571; CNA-PP-430) Avail: NTIS HC A02/MF A01 CSCL 01/3

This paper attempts to clarify the relationships among the following four hypotheses: (1) the number of material failures across intervals of calender time containing equal accumulated flight hours follows a Poisson distribution; (2) the number of elapsed flight hours between successive independent material failures follows an exponential distribution; (3) the expected number of monthly material failures is exactly proportional to monthly flight hours; and (4) the observed number of monthly material failures is strongly correlated with monthly flight hours. By a well-known result, hypotheses (1) and (2) are equivalent. By a second well-known result, hypotheses (1) and (3) are also equivalent. However, hypotheses (1) and (4) are not equivalent. That is, while the expected number of failures is exactly proportional to flight hours under a Poisson distribution, this relationship is not revealed by a linear regression between failures and flight hours. For example, we demonstrate that if the mean and variance of flight hours across months are equal and if the failure rate per flight hour equals .01, then the correlation between failures and flight hours will equal .10. GRA

N86-15449# Joint Publications Research Service, Arlington, Va.
MBB STUDIES VARIABLE-CAMBER WING FOR AIRBUS
In its West Europe Report: Science and Technology (JPRS-WST-85-024) 13 Aug. 1985 p 20-21 Transl. into ENGLISH from MBB Aktuell (West Germany), Feb. 1985 p 3 (For primary document see N86-15447 06-31)
Avail: NTIS HC A04/MF A01

N86-15450# Joint Publications Research Service, Arlington, Va.
FRENCH PROGRAM CHARME DEVELOPS PROPFAN AIRCRAFT
In its West Europe Report: Science and Technology (JPRS-WST-85-024) 13 Aug. 1985 p 22-24 Transl. into ENGLISH from AFP Sciences (Paris), 14 Mar. 1985 p 25-27 (For primary document see N86-15447 06-31)
Avail: NTIS HC A04/MF A01

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N86-15312# National Aerospace Lab., Tokyo (Japan).
DYNAMIC CHARACTERISTICS OF AIR DATA SENSOR SYSTEMS: ALTIMETER, SPEEDOMETER AND ALPHA TIMES BETA VANE
Yukichi Tsukano and Takatsugu Ono [1985] 20 p refs In JAPANESE; ENGLISH summary
(NAL-TR-852; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Dynamic response characteristics of air-data-sensor systems including a pressure altitude sensor, a dynamic pressure sensor and a alpha-beta vane are described in this paper. These air data sensors are currently used as part of instrumentation systems for the Variable Stability and Response Airplane (VSRA). Responses of the pressure sensor system to stepwise inputs from both static and total pressure ports were measured and analyzed to identify the dynamic model of the system, which is assumed to be linear. Response of a alpha-beta vane to initial displacement were measured in a 2 m diameter wind tunnel at wind speeds from 30 m/s and the assumed dynamic model including weak nonlinearity was identified. Author

N86-15947# Joint Publications Research Service, Arlington, Va.
WORK ON PUTTING COMPUTER AND CRTS IN AIRLINER CONTROL PANELS

V. Tseyukov *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-009) 19 Nov. 1985 p 25-26 Transl. into ENGLISH from Vozdushnyy Transport (Moscow, USSR), 17 Aug. 1985 p 3 (For primary document see N86-15943 06-60)
Avail: NTIS HC A04

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N86-15313*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DYNAMIC RESPONSE OF FILM THICKNESS IN SPIRAL-GROOVE FACE SEALS
Eliseo DiRusso Dec. 1985 22 p refs
(NASA-TP-2544; E-2683; NAS 1.60:2544) Avail: NTIS HC A02/MF A01 CSCL 21E

Tests were performed on an inward- and an outward-pumping spiral-groove face seal to experimentally determine the film thickness response to seal seat motions and to gain insight into the effect of secondary seal friction on film thickness behavior. Film thickness, seal seat axial motion, seal frictional torque, and film axial load were recorded as functions of time. The experiments revealed that for sinusoidal axial oscillations of the seal seat, the primary ring followed the seal seat motion very well. For a skewed seal seat, however, the primary ring did not follow the seal seat motion, and load-carrying capacity was degraded. Secondary seal friction was varied over a wide range to determine its effect on film thickness dynamics. The seals were tested with ambient air at room temperature and atmospheric pressure as the fluid medium. The test speed ranged from 7000 to 20,000 rpm. Seal tangential velocity ranged from 34 to 98 m/sec (113 to 323 ft/sec). Author

N86-15314*# National Aeronautics and Space Administration, Washington, D.C.
REVIEW OF THE DEVELOPMENT OF SMALL- AND MEDIUM-CAPACITY GAS TURBINES AT THE MOTOREN- UND TURBINEN UNION
Wolfgang Heilmann Nov. 1985 31 p refs Transl. into ENGLISH of conf. paper DGLR-77-061, "Ubersicht uber die Entwicklung von Gasturbinen Kleiner und Mittlerer Leistung in der MTU" presented at the German Aerospace Society Symposium on Small Gas Turbines, 1977 p 1-30 Symposium held in Stuttgart, West Germany, 11-12 Oct. 1977 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-4004)
(NASA-TM-77942; NAS 1.15:77942; DGLR-77-061) Avail: NTIS HC A03/MF A01 CSCL 21E

Small- and medium-capacity gas turbines under development for turboprop aircraft and helicopter, as well as for armored and commercial vehicle propulsion, are discussed. Design problems related to axial turbines, ceramic components, regenerative gas turbines, and the optimal expansion ratios for turbines with capacities from 250 to greater than 800 kW are considered; in addition, combustion chamber technology is mentioned. Prototype gas turbines with capacities of 500 to 600 kW or 800 to 1800 kW are described. Author

N86-15315# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ANALYSIS OF THE EFFECTS OF TRANSIENT HEAT TRANSFER ON AXIAL FLOW COMPRESSOR BLADE BOUNDARY LAYERS M.S. Thesis
C. W. Wood Jun. 1985 69 p
(AD-A158094; AFIT/CI/NR-85-87T) Avail: NTIS HC A04/MF A01 CSCL 21/5

This thesis determines the magnitude of heat transfer in the high-pressure compressor of a turbofan engine during a Bodie throttle transient and estimates the effect of transient heat transfer on compressor blade boundary layer growth. Total stored thermal energy available for release is determined considering compressor blades and roots only. Thermal energy released during a throttle transient is determined and allocated to individual compressor stages and used to estimate blade heat flux. The average heat transfer coefficient at the maximum heat transfer rate is also calculated. A simple boundary layer analysis is performed assuming zero pressure gradient, compressible turbulent flow over a flat plate. Under free-stream conditions similar to those in the tenth stage of the compressor, this analysis shows increased boundary layer displacement thickness with heat transfer. In zero pressure gradient, the displacement thickness change with heat transfer is small, as is the change in flow deviation angle at the trailing edge of the compressor blade. Heat transfer coefficients are also calculated in the boundary layer analysis and agree with results from the experimental heat transfer allocation procedure to within 30%. Results of boundary layer analysis indicate assumptions made in heat transfer allocation procedure are reasonable and that simple boundary layer analysis with the absence of modifying pressure gradients provides a good first estimate of heat transfer effects on blade boundary layers. GRA

N86-15316# Institute for Defense Analyses, Alexandria, Va.
SMALL TURBINE TECHNOLOGY REVIEW Final Report, Feb. - Dec. 1984
I. C. Oelrich, D. D. Weidhuner, and F. R. Riddell Jul. 1985 91 p
(Contract MDA903-84-C-0031)
(AD-A158514; AD-E500724; IDA-P-1840; IDA/HQ-85-29944) Avail: NTIS HC A05/MF A01 CSCL 21/5

This study, for OUSDRE (Research and Advanced Technology, Military Systems Technology), examines the nature of the small gas turbine development process for military applications, attempts to identify gaps between current programs and probable future needs, and makes program recommendations for acquiring desirable new turbine technology. Small turbines are found to fall into one of four categories: man-rated, expendable, auxiliary power, and ground vehicle engines. The technical requirements of each category are reviewed and possible R&D opportunities identified. GRA

N86-15317# Department of the Air Force, Washington, D.C.
RESONANT CAVITIES FOR STALL RECOVERY IN GAS TURBINE ENGINES Patent Application
French, inventor (to Air Force) Filed 23 Jul. 1985 20 p
(AD-D011891; US-Patent-Appl-SN-757994) Avail: NTIS HC A02/MF A01 CSCL 21/5

The present patent application is related generally to aircraft which use gas turbine engines as a means of propulsion, and specifically to a means for improvement in the stall recoverability characteristics of such gas turbine engines through the use of resonant cavities. The ability of gas turbine engines to recover when their compressors enter a rotating stall is enhanced with the accessing resonant cavity to the compressor exhaust port. The added volume of the resonant cavities induces a dynamically unstable operating point in the rotating stall as the cavity acts as a Helmholtz resonator matched with the dynamics of the primary flow. The resonant cavity is effective in enhancing the stall recovery characteristics of the engine. GRA

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N86-15318# Advanced Engineering Lab., Salisbury (Australia).
FLUTTER GENERATOR CONTROL AND FORCE COMPUTER

R. W. Levinge Jul. 1985 60 p
(AEL-0242-TM; AR-004-156) Avail: NTIS HC A04/MF A01

The possibility of flutter induced by a store carried under the wing of an aircraft is investigated. This involves in-flight dynamic analysis of structural deformations at given points on an airframe due to forces originating in the store. A system of rotating eccentric masses generates a force spectrum 2.4 to 20.0 Hz in both horizontal and vertical axes. Electronically controlled, the Flutter Generator runs for 28 s with a swept frequency of force is computed continuously and telemetered to ground as an analogue signal. Author

N86-15319*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PREDICTION OF WING AEROELASTIC EFFECTS ON AIRCRAFT LIFT AND PITCHING MOMENT CHARACTERISTICS
Clinton V. Eckstrom Nov. 1985 22 p refs Presented at the Aircraft Flight Loads Technology Transfer Conference, Washington, D.C., 16-17 Oct. 1985
(NASA-TM-87631; NAS 1.15:87631) Avail: NTIS HC A02/MF A01 CSCL 01C

The distribution of flight loads on an aircraft structure determines the lift and pitching moment characteristics of the aircraft. When the load distribution changes due to the aeroelastic response of the structure, the lift and pitching moment characteristics also change. Some estimate of the effect of aeroelasticity on stability and control characteristics, particularly lift and pitching moment, is required for use in aircraft simulation models for evaluation of flight characteristics. This presentation outlines a procedure to incorporate aeroelastic effects into lift and pitching moment data from wind tunnel tests. Results are presented which were obtained from applying this procedure to an aircraft with a very flexible transport-type research wing. The procedure described is generally applicable to all types of aircraft. Author

N86-15320*# Information and Control Systems, Inc., Hampton, Va.
PIFCGT: A PIF AUTOPILOT DESIGN PROGRAM FOR GENERAL AVIATION AIRCRAFT
John R. Broussard Dec. 1983 176 p
(Contract NAS1-16303)
(NASA-CR-166123; NAS 1.26:166123; TR-681103) Avail: NTIS HC A09/MF A01 CSCL 01C

This report documents the PIFCGT computer program. In FORTRAN, PIFCGT is a computer design aid for determing Proportional-Integral-Filter (PIF) control laws for aircraft autopilots implemented with a Command Generator Tracker (CGT). The program uses Linear-Quadratic-Regulator synthesis algorithms to determine feedback gains, and includes software to solve the feedforward matrix equation which is useful in determining the command generator tracker feedforward gains. The program accepts aerodynamic stability derivatives and computes the corresponding aerodynamic linear model. The nine autopilot modes that can be designed include four maneuver modes (ROLL SEL, PITCH SEL, HDG SEL, ALT SEL), four final approach models (APR GS, APR LOCI, APR LOCR, APR LOCP), and a BETA HOLD mode. The program has been compiled and executed on a CDC computer. Author

N86-15321# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
USE OF HINGED STRAKES FOR LATERAL CONTROL AT HIGH ANGLES OF ATTACK M.S. Thesis
R. E. Erb May 1985 164 p
(AD-A158005; AFIT/CI/NR-85-61T) Avail: NTIS HC A08/MF A01 CSCL 20/4

This thesis investigated the feasibility of using a portion of the leading edge (LE) strake hinged along the longitudinal axis as a roll control device for a high performance aircraft at high angles of attack (AOA). A wind tunnel test was conducted to gather static force and moment data for use in a six degree of freedom computer simulation. Asymmetric strake deflections, both dihedral and anhedral, were investigated. The longitudinal coefficients were little affected by strake deflection, but the lateral directional coefficients showed a nonlinear, but repeatable, behavior with strake deflection. Comparisons to be published data indicate that the strakes produce similar behavior for different aircraft designs. Simulations of the aircraft response to the strakes showed that an improvement over current roll performance could be obtained by combining the positive strake deflection with the ailerons up to 38 deg. AOA, after which the strakes alone produced the best roll performance. Sideslip and AOA must be closely controlled or the aircraft will either not roll, or will depart during the roll. The roll performance using hinged strakes at high AOA is compared to roll performance using differential (LE) flaps. The diffential LE flaps produce comparable roll rates with less sideslip than produced by the hinged strakes. However, the possibility exists of combining hinged strakes with differential (LE) flaps for improved roll performance. GRA

N86-15322# Southwest Research Inst., San Antonio, Tex.
DIGITAL SERVOCONTROLLER SYSTEM. VOLUME 2. MAINTENANCE MANUAL Final Report, 6 Jul. 1983 - 6 Nov. 1984
J. Lopez and K. Miller Feb. 1985 70 p
(Contract F33615-83-C-3201)
(AD-A159066; SwRI-14-7676-060-Vol-2;
AFWAL-TR-84-3117-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 09/2

This final report describes an exploratory development effort for the design and fabrication of a digital servocontroller system for load control in full-scale air-frame fatigue tests. Each digital controller replaces four analog controllers. The LSI-11/23 microcomputer in the digital controller executes a PI algorithm to implement direct digital control. It may operate in a stand-alone mode or as a slave processor to a master computer via fiber optic link. Other programmable features specifying loop parameters, building load profiles, adjusting control system gains and monitoring alarm and abort conditions. GRA

N86-15281*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE USE OF ACTIVE CONTROLS TO AUGMENT ROTOR/FUSELAGE STABILITY
Friedrich K. Straub (Hughes Helicopters, Inc., Culver City, Calif.) and William Warmbrodt *In its* Rotorcraft Dynamics 1984 Nov. 1985 p 1-15 refs Previously announced in IAA as A85-43220 (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

N86-15282*# Kaman Aerospace Corp., Bloomfield, Conn.
GROUND RESONANCE ANALYSIS USING A SUBSTRUCTURE MODELING APPROACH
Shyi-Yaung Chen, Edward E. Austin (Applied Technology Lab., Fort Eustis, Va.), and Alex Berman *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 16-26 (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

N86-15283*# Boeing Vertol Co., Philadelphia, Pa.
PARAMETRIC STUDY OF THE AEROELASTIC STABILITY OF A BEARINGLESS ROTOR
W. Euan Hooper *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 27-43 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

N86-15284*# Duke Univ., Durham, N. C. Dept. of Mechanical Engineering and Material Science.
NONLINEAR DYNAMICS OF A HELICOPTER MODEL IN GROUND RESONANCE
D. M. Tang and E. H. Dowell *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 45-55 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

N86-15286*# Army Aviation Systems Command, Moffett Field, Calif. Aeromechanics Lab.
EXPERIMENTALLY DETERMINED FLUTTER FROM TWO- AND THREE-BLADED MODEL BEARINGLESS ROTORS IN HOVER
William G. Bousman and Seth Dawson *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 69-88 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

N86-15294*# California Univ., Los Angeles. Dept. of Mechanical, Aerospace and Nuclear Engineering.
INFLUENCE OF VARIOUS UNSTEADY AERODYNAMIC MODELS ON THE AEROMECHANICAL STABILITY OF A HELICOPTER IN GROUND RESONANCE
P. P. Friedmann and C. Venkatesan *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 207-219 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

N86-15295*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE INFLUENCE OF DYNAMIC INFLOW AND TORSIONAL FLEXIBILITY ON ROTOR DAMPING IN FORWARD FLIGHT FROM SYMBOLICALLY GENERATED EQUATIONS
T. S. R. Reddy and William Warmbrodt *In its* Rotorcraft Dynamics 1984 Nov. 1985 p 221-240 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

N86-15296*# Maryland Univ., College Park. Center for Rotorcraft Education and Research.
FLAP-LAG-TORSION STABILITY IN FORWARD FLIGHT
Brahmananda Panda and Inderjit Chopra *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 241-258 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

N86-15297*# Maryland Univ., College Park. Center for Rotorcraft Education and Research.
DYNAMIC STABILITY OF A BEARINGLESS CIRCULATION CONTROL ROTOR BLADE IN HOVER
Inderjit Chopra *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 259-271 (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

N86-15299*# Sikorsky Aircraft, Stratford, Conn.
AN EXAMINATION OF THE RELATIONS BETWEEN ROTOR VIBRATORY LOADS AND AIRFRAME VIBRATIONS
Charles F. Niebanck *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 287-305 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

N86-15301*# Washington Univ., St. Louis, Mo. Dept. of Mechanical Engineering.
COUPLED ROTOR-BODY VIBRATIONS WITH INPLANE DEGREES OF FREEDOM
Huang Ming-Sheng and David A. Peters *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 325-341 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

N86-15302*# United Technologies Research Center, East Hartford, Conn. Aeromechanics Research.
ANALYSIS OF POTENTIAL HELICOPTER VIBRATION REDUCTION CONCEPTS
Anton J. Landgrebe and Mark W. Davis *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 243-363 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

N86-15303*# Sikorsky Aircraft, Stratford, Conn.
ADAPTATION OF A MODERN MEDIUM HELICOPTER (SIKORSKY S-76) TO HIGHER HARMONIC CONTROL
James J. OLeary, Sesi B. R. Kottapalli, and Mark W. Davis *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 365-378 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 01C

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N86-15323*# Kansas Univ. Center for Research, Inc., Lawrence.
AN ANALYSIS OF CROSS-COUPLING OF A MULTICOMPONENT JET ENGINE TEST STAND USING FINITE ELEMENT MODELING TECHNIQUES Final Report
William G. Schweikhard and Werachone N. Singnoi [1985] 55 p refs
(Grant NAG3-85)
(NASA-CR-176424; NAS 1.26:176424) Avail: NTIS HC A04/MF A01 CSCL 14B

A two axis thrust measuring system was analyzed by using a finite a element computer program to determine the sensitivities of the thrust vectoring nozzle system to misalignment of the load cells and applied loads, and the stiffness of the structural members. Three models were evaluated: (1) the basic measuring element and its internal calibration load cells; (2) the basic measuring element and its external load calibration equipment; and (3) the basic measuring element, external calibration load frame and the altitude facility support structure. Alignment of calibration loads was the greatest source of error for multiaxis thrust measuring systems. Uniform increases or decreases in stiffness of the members, which might be caused by the selection of the materials, have little effect on the accuracy of the measurements. It is found that the POLO-FINITE program is a viable tool for designing and analyzing multiaxis thrust measurement systems. The response of the test stand to step inputs that might be encountered with thrust vectoring tests was determined. The dynamic analysis show a potential problem for measuring the dynamic response characteristics of thrust vectoring systems because of the inherently light damping of the test stand. E.A.K.

N86-15324# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
CONCEPTS FOR THE DEVELOPMENT OF A NONDESTRUCTIVE TESTING AND EVALUATION SYSTEM FOR RIGID AIRFIELD PAVEMENTS Ph.D. Thesis
P. T. Foxworthy 1985 274 p
(AD-A158004; AFIT/CI/NR-85-93T) Avail: NTIS HC A12/MF A01 CSCL 13/2

This thesis develops a complete system for nondestructive testing and evaluation of rigid airfield pavements. An extensive review of present destructive and nondestructive equipment and methodologies is made to form the basis for selection of the equipment and analytical model used in this research. A brief description of the selected Dynatest Model 8000 Falling Weight Deflectometer and the ILLISLAB finite element computer model is presented. Three Air Force installations were chosen for in-depth study of pavement response to FWD loads under a variety of environmental and geological conditions. Techniques are presented to determine the location of maximum damage to rigid pavement slabs for one or any combination of aircraft, and the validity of the calculated stresses is established through comparisons of measured and predicted deflections at joints. Major study findings include: (1) new designations for pavement features based on actual loading conditions, (2) guidelines for planning and conducting large scale evaluations of major airfield systems, (3) a computer-based determination of E and K, (4) joint behavior prediction under

fluctuating temperatures and their effect on generated slab stresses, (5) procedures to account for the annual distribution of traffic over the range of temperatures normally experienced at any facility, (6) a simplistic means of estimating total past damage from aircraft operations, and (7) development of computer programs to predict remaining structural life of rigid airfield pavements. GRA

N86-15325# Naval Postgraduate School, Monterey, Calif.
CONSIDERATIONS FOR THE DESIGN AND IMPLEMENTATION OF A MANAGEMENT SUPPORT SYSTEM FOR THE ELECTRONIC WARFARE SYSTEM SUPPORT LABORATORY M.S. Thesis
H. G. Banks, III Jun. 1985 80 p
(AD-A158978) Avail: NTIS HC A05/MF A01 CSCL 14/2

This thesis presents a review of current literature on management support system development, some current management philosophy, and an organizational analysis of the Electronic Warfare System Support Laboratory located at the Pacific Missile Test Center, Pt., Mugu, California. Using the knowledge gained on management system development and the organizational analysis, appropriate objectives and requirements for a management system were developed for the laboratory. Author (GRA)

N86-15326# Air Force Engineering and Services Center, Tyndall AFB, Fla. Engineering and Services Lab.
DEVELOPMENT OF PACKED-TOWER AIR STRIPPERS FOR TRICHLOROETHYLENE REMOVAL AT WURTSMITH AIR FORCE BASE, MICHIGAN Final Report, Dec. 1979 - Mar. 1985
R. L. Gross Aug. 1985 94 p
(DA Proj. 210-3)
(AD-A159139; AFESC/ESL-TR-85-28) Avail: NTIS HC A05/MF A01 CSCL 13/2

Packed-tower air stripping was researched and developed to treat trichloroethylene (TCE)-contaminated groundwater at Wurtsmith Air Force Base (Oscoda), Michigan. A leaking underground storage tank has caused a 1000 meters (3200 feet) long, 500 meters (1600 feet) wide, and 18 meters (60 feet) deep plume, with a maximum concentration approaching 10,000 ppb. While activated carbon could have produced treated water with an effluent TCE concentration below Michigan's 1.5 ppb discharge standard, the projected $1.5 million capital cost and the annual $400,000 operating and maintenance costs were prohibitive. At the request of HQ Strategic Air Command, the Engineering and Services Center investigated alternate groundwater treatment techniques. Laboratory studies were performed to determine removal efficiencies and mass transfer coefficients for TCE on 16 mm (5/8-inch) (and 25 mm (1-inch)) polypropylene Pall rings at various liquid and air flows, and at temperatures ranging from 10 to 30 C (50 to 86 F). Performance equations and removal efficiencies were combined to provide relationships for determining the required packing volume. Based on these studies, twin packed-tower air strippers were built onsite at Wurtsmith AFB. The strippers were performance-tested from May 1982 to May 1983, with removal efficiencies averaging better than 99.9 percent. GRA

N86-15327# Technology Service Corp., Santa Monica, Calif.
REAL-TIME DIGITAL TERRAIN IMAGE GENERATOR Final Report
R. Clark and R. Pferdner Jul. 1985 33 p
(Contract DAAK11-83-C-0009)
(AD-A159316; HEL-TM-10-85) Avail: NTIS HC A03/MF A01 CSCL 05/5

The Technology Service Corporation has created a real-time digital terrain image generator. The system, HELICON, has been installed and integrated into the Human Engineering Laboratory's (HEL) Human Factors Research Simulator (HFRS) system. The HELICON receives location and attitude data in real time from one of the crew station components of the HFRS and provides stylized representations of terrain as would be seen from the crew station. The HELICON system exceeds most of the contract's performance requirements, like gaming area size, flight capability, maximum viewing distance, and number of moving objects. It creates computer-generated imagery in full color at the rate of 15 frames per second (fps), with a density of 50 objects per square mile (mi2) and an image resolution of 512 x 512. Author (GRA)

N86-15328# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
PROGRAMMING A MULTIPLE-ORIFICE HYDRAULIC DECELERATOR Final Report, Mar. 1978 - Feb. 1985
C. G. Toler Jun. 1985 30 p
(AF Proj. 7231)
(AD-A159428; AAMRL-TR-85-049) Avail: NTIS HC A03/MF A01 CSCL 14/2

The AAMRL Horizontal Deceleration Facility is used to conduct experimental research for the development of design criteria for aircrew personnel protection. The hydraulic deceleration device is a water-filled cylinder. A piston mounted on the front of a deceleration sled ruptures a frangible diaphragm positioned at the opening of the cylinder and displaces the water in the cylinder through the multiple orifices. As the piston travels along the cylinder it closes off the orifices thereby decreasing the available area for the water to escape. Bernoulli's conservation-of-energy equation was applied to the physical state of fluid flow in the cylinder, allowing the orifice area to be determined as a function of the piston cross-sectional area, acceleration, velocity and weight of the sled. A computer program was developed to determine the appropriate plug orifice and location to produce desired acceleration-time profiles. The program corrects for the energy loss due to the vena contracta of each plug. Data from several tests were used to determine a correction coefficient for other losses, such as those attributable to conduit length and surface roughness, as a lumped quantity. Author (GRA)

N86-15329# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.
CONTROL SYSTEM DESIGN FOR CRYOGENIC WIND TUNNEL BY PERFORMANCE VECTOR PERFORMANCE Ph.D. Thesis - Karlsruhe Univ., West Germany
Reinhold Steinhauser Apr. 1985 191 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-965)
(DFVLR-FB-85-37; ISSN-0171-1342) Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 56

A cryogenic wind tunnel was transformed to reach higher Reynolds numbers using a controller design. The problem of a controller design for a nonlinear multivariable dead time system was solved by linearization, model decomposition, discretization and order reduction to obtain an efficient design algorithm based on pole assignment and performance vector optimization. The controller design behavior on a nonlinear model before and after performance vector optimization was studied. The optimized controller can be applied in a real wind tunnel. The reduced static pressure deviation due to performance vector optimization leads to reduced control costs for suction and injection of gaseous nitrogen. Further development of the control system design equipment as well as the development of a graphic interactive algorithm for the design procedure is recommended. Author (ESA)

N86-15446# Joint Publications Research Service, Arlington, Va.
DFVLR DEVELOPS NEW KIND OF WALLS OR WIND TUNNEL
In its West Europe Report: Science and Technology (JPRS-WST-85-015) 14 May 1985 p 18-19 Transl. into ENGLISH from Frankfurter Zeitung/Blick Durch die Wirtschaft (Frankfurt/Main), 4 Mar. 1985 p 7 (For primary document see N86-15443 06-31)
Avail: NTIS HC A04/MF A01

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N86-15330# Committee on Science and Technology (U. S. House).
SPACE ACTIVITIES OF THE UNITED STATES, SOVIET UNION

AND OTHER LAUNCHING COUNTRIES/ORGANIZATIONS, 1957-1984
Marcia S. Smith Washington GPO 1985 145 p Presented to the Subcommittee on Space Science and Applications of the Committee on Science and Technology, 99th Congress, 1st Session, Apr. 1985 Prepared by the Library of Congress, Congressional Research Service
(GPO-46-504) Avail: Subcommittee on Space Science and Applications

Five countries and one international organization currently have the capability to place satellites in space. The United States and the Soviet Union conduct the most comprehensive programs, and have been launching spacecraft for both military and civil purposes for over 25 years. The entry of countries such as Japan and the members of the European Space Agency into the space business has now introduced the element of economic competition in providing space services and hardware. This annual report reviews the space activities of the launching countries/organization--China, the European Space Agency, India, Japan, the Soviet Union, and the United States--both statistically and programmatically. This edition covers events through December 31, 1984, and highlights significant activities in 1984. Author

N86-15331# Worcester Polytechnic Inst., Mass.
ENVIRONMENTAL CONSIDERATIONS AND WASTE PLANNING ON THE LUNAR SURFACE: AN INTERACTIVE QUALIFYING B.S. Thesis
Randall A. Briggs 20 Dec. 1985 62 p refs
Avail: NTIS HC A04/MF A01

Lunar operations in the near future will generate waste management problems. Environmental considerations arising from a lunar manufacturing facility were identified. The operations chosen for the initial base were developed through discussions with various NASA officials and individuals in industries closely related with the space program. The goal of the study is to initiate conversation on fundamental questions that need to be answered before building lunar facilities. During the discussion of lunar operations, the following assumptions were taken: (1) the base will be manned by a 15 member crew; (2) the primary function of the base will be the extraction of oxygen from ilmenite (FeTiO3) via a hydrogen reduction process; (3) nuclear power will form the central power supply on the surface; and (4) a semi-closed life support system will be employed with the total resupply of food coming from earth. Author

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

No abstracts in this category.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N86-15445# Joint Publications Research Service, Arlington, Va.
SPEED OF HERMES TO GIVE EUROPEANS SPACE ACCESS, DUCROCQ SAYS
Albert Ducrocq *In its* West Europe Report: Science and Technology (JPRS-WST-85-015) 14 May 1985 p 7-11 Transl. into ENGLISH from Sciences and Avenir (Paris), Feb. 1985 p 82; 84-86 (For primary document see N86-15443 06-31)
Avail: NTIS HC A04/MF A01

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N86-15332*# San Francisco Univ., Calif. Physics Research Lab.
RADIATION MAPPING ON SPACELAB 1: EXPERIMENT NO. INS006 Final Report
E. V. Benton, A. Frank, R. Cassou, R. Henke, and V. Rowe 1 Mar. 1985 24 p refs
(Contract NAS9-15337)
(NASA-CR-171893; NAS 1.26:171893; USF-TR-68) Avail: NTIS HC A02/MF A01 CSCL 22B

The first attempt at mapping the radiation environment inside Spacelab is described. Measurements were made by a set of passive radiation detectors distributed throughout the volume inside the Spacelab 1 module, in the access tunnel and outside on the pallet. Measurements of the low linear energy transfer (LET) component obtained from the TLD thermoluminescent detectors (TLD) ranged from 92 to 134 mrad, yielding an average low LET dose rate of 10.0 mrads/day inside the module. Because of the higher inclination orbit, substantial fluxes of highly ionizing (HZE particles) high charge and energy galactic cosmic rays were observed for the first time on an STS flight, yielding an overall average mission dose-equivalent of 295 mrem, or 29.5 mrem/day, which is about three times higher than that measured on previous STS missions. Little correlation is found between measured average dose rates or HZE fluences and the estimates shielding throughout the volume of the module. E.A.K.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N86-15333*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A PROPOSED TECHNIQUE FOR THE VENUS BALLOON TELEMETRY AND DOPPLER FREQUENCY RECOVERY
Raymond F. Jurgens and Dariush Divsalar 15 Apr. 1985 51 p refs
(Contract NAS7-918)
(NASA-CR-176448; JPL-Pub-85-68; NAS 1.26:176448) Avail: NTIS HC A04/MF A01 CSCL 09F

A technique is proposed to accurately estimate the Doppler frequency and demodulate the digitally encoded telemetry signal that contains the measurements from balloon instruments. Since

the data are prerecorded, one can take advantage of noncausal estimators that are both simpler and more computationally efficient than the usual closed-loop or real-time estimators for signal detection and carrier tracking. Algorithms for carrier frequency estimation subcarrier demodulation, bit and frame synchronization are described. A Viterbi decoder algorithm using a branch indexing technique has been devised to decode constraint length 6, rate 1/2 convolutional code that is being used by the balloon transmitter. These algorithms are memory efficient and can be implemented on microcomputer systems. Author

N86-15493# Joint Publications Research Service, Arlington, Va.
OPTIMUM FREQUENCY OF COMMUNICATION CHANNEL FOR INDOOR RADIO TELEMETRY Abstract Only
A. A. Kvitka, B. I. Podlepetskiy, and S. D. Chernysheva *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 14 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 3, Mar. 1985 p 70-73 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N86-15334*# Ball Aerospace Systems Div., Boulder, Colo.
BASD: SIRTF TELESCOPE INSTRUMENT CHANGEOUT AND CRYOGEN REPLENISHMENT (STICCR) STUDY
A. J. Mord, A. R. Urbach, M. E. Poyer, L. C. Andreozzi, L. A. Hermanson, H. A. Snyder, W. R. Blalock, and R. P. Haight Aug. 1985 336 p refs
(Contract NAS2-11979)
(NASA-CR-177381; NAS 1.26:177381; F85-06) Avail: NTIS HC A15/MF A01 CSCL 22B

The Space Infrared Telescope Facility (SIRTF) is a long-life cryogenically cooled space-based telescope for infrared astronomy from 2 micrometer to 700 miocrometers currently under study by NASA-ARC, and planned for launch in approximately the mid 90's. SIRTF will operate as a multi-user facility, initially carrying 3 instruments at the focal plane. It will be cooled to below 2 K by superfluid liquid helium to achieve radiometric sensitivity limited only by the statistical fluctuations in the natural infrared background radiation over most of its spectral range. The lifetime of the mission will be limited by the lifetime of the liquid helium supply, and is currently baselined to be 2 years. The telescope changes required to allow in-space replenishment of the 2,000 liter superfluid helium tank are investigated. A preliminary design for the space services equipment is also developed. The impacts of basing the equipment and servicing on the space station are investigated. Space replenishment and changeout of instruments requires changes to the telescope design and preliminary concepts are presented. Author

N86-15335*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CATALYTIC SURFACE EFFECTS ON CONTAMINATED SPACE SHUTTLE TILE IN A DISSOCIATED NITROGEN STREAM
Orvel L. Flowers and David A. Stewart Nov. 1985 17 p refs
(NASA-TM-86770; Rept-85328; NAS 1.15:86770) Avail: NTIS HC A02/MF A01 CSCL 22B

Visual inspection revealed contamination on the surface of tiles removed from the lower section of the space shuttle orbiter after the second flight of Columbia (STS-2). Possible sources of this contamination and the effect on surface catalycity are presented. Author

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N86-15336 Department of the Air Force, Washington, D.C.
SOLAR ROCKET ABSORBER Patent
P. I. Robinson, inventor (to Air Force) Issued 16 Jul. 1985 5 p Supersedes AD-D010773
(AD-D011897; US-Patent-4,528,978; US-Patent-Appl-SN-559169; US-Patent-Class-126-438) Avail: US Patent and Trademark Office CSCL 21/8

In this patent a solar rocket absorber of rhenium tubes is used to provide heated liquid hydrogen to a thruster. The rhenium tubes are wrapped in a closed shape having an opening for receiving solar radiation for heating the liquid propellant. The vessel of rhenium tubes is held by a carbon shell which is further encased in a reradiation shield to prevent heat loss. GRA

N86-15337*# Queensland Univ., Brisbane (Australia). Dept. of Mechanical Engineering.
SCRAMJET SIDEWALL BURNING: PRELIMINARY SHOCK TUNNEL RESULTS
R. G. Morgan, A. Paull, N. Morris, and R. J. Stalker [1985] 56 p refs
(Grant NAGw-674)
(NASA-CR-176420; NAS 1.26:176420; Rept-12/85) Avail: NTIS HC A04/MF A01 CSCL 21H

Experiments performed with a two dimensional model scramjet with particular emphasis on the effect of fuel injection from a wall are reported. Air low with a nominal Mach number of 3.5 and varied enthalpies was produced. It was found that neither hydrogen injection angle nor combustor divergence angle had any appreciable effect on thrust values while increased combustor length appeared to increase thrust levels. Specific impulse was observed to peak when hydrogen was injected at an equivalence ratio of about 2. Lowering the Mach number of the injected hydrogen at low equivalence ratios, less than 4, appeared to benefit specific impulse while hydrogen Mach number had little effect at higher equivalence ratios. When a 1:1 mixture by volume of nitrogen and oxygen is used instead of air as a test gas, it is found that hydrogen combustion is enhanced but only at high enthalpies. E.A.K.

N86-15338*# Rockwell International Corp., Downey, Calif.
ADVANCED INTEGRATED POWER AND ATTITUDE CONTROL SYSTEM (IPACS) STUDY Final Report
Ronald E. Oglevie and David B. Eisenhaure (Draper (Charles Stark) Lab., Cambridge, Mass.) Washington NASA Nov. 1985 170 p refs
(Contract NAS1-17633)
(NASA-CR-3912; NAS 1.26:3912; SSS85-0025) Avail: NTIS HC A08/MF A01 CSCL 22B

Integrated Power and Attitude Control System (IPACS) studies performed over a decade ago established the feasibility of simultaneously satisfying the demands of energy storage and attitude control through the use of rotating flywheels. It was demonstrated that, for a wide spectrum of applications, such a

system possessed many advantages over contemporary energy storage and attitude control approaches. More recent technology advances in composite material rotors, magnetic suspension systems, and power control electronics have triggered new optimism regarding the applicability and merits of this concept. This study is undertaken to define an advanced IPACS and to evaluate its merits for a space station application. System and component designs are developed to establish the performance of this concept and system trade studies conducted to examine the viability of this approach relative to conventional candidate systems. It is clearly demonstrated that an advanced IPACS concept is not only feasible, but also offers substantial savings in mass and life-cycle cost for the space station mission. Author

N86-15339*# Boeing Aerospace Co., Seattle, Wash.
SPACE STATION PROPULSION REQUIREMENTS STUDY Final Report
Calvin L. Wilkinson and Scott M. Brennan Aug. 1985 484 p
(Contract NAS3-23353)
(NASA-CR-174934; NAS 1.26:174934; D180-28264-1) Avail: NTIS HC A21/MF A01 CSCL 21H

Propulsion system requirements to support Low Earth Orbit (LEO) manned space station development and evolution over a wide range of potential capabilities and for a variety of STS servicing and space station operating strategies are described. The term space station and the overall space station configuration refers, for the purpose of this report, to a group of potential LEO spacecraft that support the overall space station mission. The group consisted of the central space station at 28.5 deg or 90 deg inclinations, unmanned free-flying spacecraft that are both tethered and untethered, a short-range servicing vehicle, and a longer range servicing vehicle capable of GEO payload transfer. The time phasing for preferred propulsion technology approaches is also investigated, as well as the high-leverage, state-of-the-art advancements needed, and the qualitative and quantitative benefits of these advancements on STS/space station operations. The time frame of propulsion technologies applicable to this study is the early 1990's to approximately the year 2000. Author

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N86-15340# Committee on Science and Technology (U. S. House).
CONGRESSIONAL WORKSHOP ON ADVANCED MATERIALS RESEARCH AND DEVELOPMENT
Washington GPO 1985 119 p Presented to the Committee on Science and Technology, 99th Congress, 1st Session, Jun. 1985
(GPO-47-717) Avail: US Capitol, House Document Room

A workshop was held on materials research and development sponsored by the House Committee on Science and Technology. Over forty representatives from industry, academia and the Federal government were selected to participate in the workshop. The workshop was to provide assistance to the Committee in carrying out its oversight responsibility with respect to the National Critical Materials Act of 1984 relating to advanced materials research and development. In particular, the workshop focused on the parameters necessary to define a national federal advanced materials program plan. While broader issues were considered, discussion focused on three areas related to the materials R&D infrastructure: (1) materials research facilities; (2) materials engineering and science; and (3) research establishments. Author

N86-15341# Illinois Univ., Urbana. Dept. of Chemistry.
CHEMILUMINESCENCE FROM ORGANIC REACTIONS. FORMATION OF DIPHENOYL PEROXIDE AS AN INTERMEDIATE
C. B. Little and G. B. Schuster 30 Aug. 1985 28 p
(Contract N00014-76-C-0745)
(AD-A159144) Avail: NTIS HC A03/MF A01 CSCL 07/4

Visible, long-lasting chemiluminescence results when diphenic anhydride and p-nitroperoxybenzoic acid in THF are treated with powdered KOH in the presence of a catalytic chemiluminescence (CIEEL) activator. This chemiluminescent process is presumed to involve in situ generation of diphenoyl peroxide, which then undergoes chemiluminescent decomposition by the CIEEL mechanism. Carboxylate 4, the precursor to diphenoyl peroxide in this reaction, was generated by an entirely different route from peroxide 5. Author (GRA)

N86-15342# Illinois Univ., Urbana. Dept. of Chemistry.
REACTIONS OF SINGLET OXYGEN WITH ENOL ESTERS
S. L. Wilson and G. B. Schuster 30 Aug. 1985 24 p
(Contract N00014-76-C-0745)
(AD-A159160; TR-38) Avail: NTIS HC A02/MF A01 CSCL 07/3

Singlet oxygenation of (l-adamantylidene)ethyl acetate (4) and 6,6-dimethylcyclohex-l-enyl acetate (7) produces only ene reaction products. Photooxygenation of Delta 1,6-2-oxabicyclo(4.4.0)decen-3-one (9), in contrast, yields ene, acyl-shifted, and (2+2) cycloaddition products. The product distribution resulting from oxidation of 9 indicates that attack of singlet oxygen (1O2) occurs exclusively on the same side of the double bond as the ester functional group. The bimolecular rate constant for reaction of 9 with 1O2 is found to be ca. 50 times larger than those of 4 and 7. These results are explained most economically by invoking the initial formation of perepoxide intermediate. In the case of 9, stabilization of the transition state leading to the perepoxide by interaction of the incoming 1O2 molecule with the ester functionality produces the observed rate enhancement and stereospecificity. Author (GRA)

N86-15343# Air Force Academy, Colo.
UNITED STATES AIR FORCE ACADEMY, DEPARTMENT OF CHEMISTRY RESEARCH: AY 1983-1984 Final Report, 1 Jun. 1983 - 31 May 1984
L. P. Davis Jul. 1985 127 p
(AD-A159319; USAFA-TR-85-3) Avail: NTIS HC A07/MF A01 CSCL 07/1

Department of Chemistry Research during AY-1983-84 has progressed well in the areas of energetic materials, theoretical chemistry, and catalysis research. Working closely with Frank J. Seiler Research Laboratory on many of these projects, department researchers have synthesized new energetic compounds. Theoretical methods have been used to study basic silicon chemistry and biochemical molecules. Spectroscopic studies of the photodegradation of riboflavin have lead to an understanding of this important photochemical reaction. The following topics are discussed: synthesis of polynitrophenyl acetylenes; regiospecific fluorination of aryl anions with xenon difluoride; correlation of sigma 13 constants with NMR chemical shifts in Fluorine, Phosphorus, and nitrogen-containing styrene derivatives; photodegradation of riboflavin; a quantum-chemical study relating pseudorotation to the stereochemistry of nucleophilic substitution in silicon; and theoretical calculations of the peptide bond. GRA

N86-15344# Joint Publications Research Service, Arlington, Va.
USSR REPORT: CHEMISTRY Abstracts Only
22 Oct. 1985 72 p Transl. into ENGLISH from various Russian articles
(JPRS-UCH-85-013) Avail: NTIS HC A04/MF A01

USSR Report - Chemistry, 22 October 1985 (JPRS-UCH-85-013) contains articles on adsorption, catalysis, coal gasification, electrochemistry, free radicals, inorganic compounds, nitrogen compounds, organometallic compounds, organophosphorus compounds, petroleum processing technology, pharmacology and toxicology, polymers and polymerization, rubber and elastomers, and water treatment. Of particular interest in this issue are articles on jet engine fuels and metal-polymer composites. For individual titles, see N86-15345 through N86-15347.

N86-15345# Joint Publications Research Service, Arlington, Va.
EVALUATING STRUCTURAL CHANGES IN JET FUELS BY ELECTRICAL CONDUCTIVITY AND VISCOSITY c28

A. I. Belousov and Ye. M. Bushuyeva *In its* USSR Report: Chemistry (JPRS-UCH-85-013) 22 Oct. 1985 p 39-40 Transl. into ENGLISH from Khimiya i Tekhnologiya Topliv i Masel (Moscow, USSR), no. 3, Mar. 1985 p 20-21 (For primary document see N86-15344 06-23)
Avail: NTIS HC A04/MF A01

Using the temperature-electrical conductivity relationship of jet fuels alone as an indication of structural changes gives contradictory results. A study is made using both conductivity and viscosity relationships to temperature at -60 C to + 80 C. RT, TS-1 and T-1 jet fuels exhibit linear temperature-conductivity curves, indicating no structural changes. A break in the curve below 20 C for T-6 fuels indicate a change. Temperature viscosity at -50 C to +80 C for RT, TS-1 and T-1 fuels are also linear (no structural change) and confirm the conductivity results. Breaks in these curves at -40 C and at +20 C for T-6 fuel indicate structural changes and also confirm the conductivity data. These curves may thus be used to evaluate structural changes in jet fuels. These changes may be prevented by using special additives or by blending with less viscous fuels. Author

N86-15346# Joint Publications Research Service, Arlington, Va.
EFFECTS OF VIBRATION-INDUCED CAVITATION OF PHYSICOCHEMICAL CHARACTERISTICS OF AIRCRAFT FUEL c28
P. P. Mertsalov, B. G. Bedrik, and K. L. Suponko *In its* USSR Report: Chemistry (JPRS-UCH-85-013) 22 Oct. 1985 p 46-47 Transl. into ENGLISH from Khimiya i Tekhnologiya Topliv i Masel (Moscow, USSR), no. 7, Jul. 1985 p 23-25 (For primary document see N86-15344 06-23)
Avail: NTIS HC A04/MF A01

An analysis was conducted on the factors leading to vibration-induced cavitation in aircraft fuel, resulting from sudden changes in hydrostatic pressure and resultant variability in tensile stresses. The data demonstrates that both hydrodynamic and aircraft factors are predisposed to maximum cavitation in the vibration range of 30 to 300 Hz and vibroaceleration of 10 to 30 g. The specific alterations in fuels TS-1 and T-6 consist of changes in the granulometric profile with an increase in the percentage of particles 1 to 5 micron in size and a decrease in the percentages of those in the 5 to 100 micron (most pronounced with the 15 to 100 micron fraction). Other changes include a decrease in fuel viscosity and thermal stability, and an increase in tar substances. Vibration is, therefore, an important factor to be considered in the formulation and testing of new aviation fuels. Author

N86-15347# Joint Publications Research Service, Arlington, Va.
ENERGY FUNCTION AND CONDUCTIVITY OF METAL-POLYMER COMPOSITES c24
O. N. Khitrova, A. M. Danyushina, Yu. S. Mardashev, and B. V. Yerofeyev *In its* USSR Report: Chemistry (JPRS-UCH-85-013) 22 Oct. 1985 p 49-50 Transl. into ENGLISH from Vestsi Akademii Navuk BSSR: Seryya Khimichnykh Navuk (Minsk, USSR), no. 3, May-Jun. 1985 p 105-106 (For primary document see N86-15344 06-23)
Avail: NTIS HC A04/MF A01

The work function of electrons from polymer or metal as a function of electrical conductivity at the percolation zone is studied in two series of composites. In the first series (Zn + polyethylene), the metal is varied, and in the second (Zn + polyethylene, polyvinyl alcohol, polytetrafluoroethylene), the polymer is varied. The rise in conductivity of the composite is shown to vary with the work function of the polymer, which is apparently related to the transfer mechanism. The conductivity of the composite is thus determined by the nature of the dielectric (polymer). Author

24 COMPOSITE MATERIALS

Includes laminates.

N86-15348*# California Inst. of Tech., Pasadena. Graduate Aeronautical Labs.
EFFECT OF STRESS CONCENTRATIONS IN COMPOSITE STRUCTURES Progress Report
C. D. Babcock and A. M. Waas Nov. 1985 47 p refs
(Grant NsG-1483)
(NASA-CR-176410; NAS 1.26:176410; SM-85-12) Avail: NTIS HC A03/MF A01 CSCL 11D

Composite structures have found wide use in many engineering fields and a sound understanding of their response under load is important to their utilization. An experimental program is being carried out to gain a fundamental understanding of the failure mechanics of multilayered composite structures at GALCIT. As a part of this continuing study, the performance of laminated composite plates in the presence of a stress gradient and the failure of composite structures at points of thickness discontinuity is assessed. In particular, the questions of initiation of failure and its subsequent growth to complete failure of the structure are addressed. Author

N86-15349*# Wyoming Univ., Laramie. Composite Materials Research Group.
MECHANICAL PROPERTIES TESTING OF CANDIDATE POLYMER MATRIX MATERIALS FOR USE IN HIGH PERFORMANCE COMPOSITES Contractor Report, May 1983 - May 1984
Richard S. Zimmerman and Donald F. Adams Dec. 1985 301 p refs
(Grant NAG1-277)
(NASA-CR-177970; NAS 1.26:177970; UWME-DR-401-104-1)
Avail: NTIS HC A14/MF A01 CSCL 11D

The mechanical properties of four candidate neat resin systems for use in graphite/epoxy composites are characterized. This includes tensile and shear stiffnesses and strengths, coefficients of thermal and moisture expansion, and fracture toughness. Tests are conducted on specimens in the dry state and moisture-saturated, at temperatures of 23C, 82C and 121C. The neat resins tested are Hexcel HX-1504, Narmco 5245-C, American Cyanamid CYCOM 907, and Union Carbide ERX-4901A (MDA). Results are compared with those obtained for four other epoxy resins tested in a prior program, i.e., Hercules 3502, 2220-1, and 2220-3, and Ciba-Geigy Fibredux 914, as well as with available Hercules 3501-6 data. Scanning electron microscopic examination of fracture surfaces is performed to permit the correlation of observed failure modes with the environmental test conditions. A finite element micromechanics analysis is used to predict unidirectional composite response under various test conditions, using the measured neat resin properties as input data. Author

N86-15350*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
STRESS CONCENTRATION AROUND A SMALL CIRCULAR HOLE IN THE HIMAT COMPOSITE PLATE
William L. Ko Dec. 1985 18 p refs
(NASA-TM-86038; H-1235; NAS 1.15:86038) Avail: NTIS HC A02/MF A01 CSCL 11D

Anisotropic plate theory is used to calculate the anisotropic stress concentration factors for a composite plate (AS/3501-5 graphite/epoxy composite, single ply or laminated) containing a circular hole. This composite material is used on the highly maneuverable aircraft technology (HiMAT) vehicle. It is found that the anisotropic stress concentration factor could be greater or less than 3 (the stress concentration factor for isotropic materials), and that the locations of the maximum tangential stress points could shift with the change of fiber orientation with respect to the loading axis. The effect of hole size on the stress concentration factor is examined using the Point Stress Criterion and the Averaged Stress Criterion. The predicted stress concentration factors based on the two theories compared fairly well with the measured values for the hole size 0.3175 cm (1/8 in). It is also found that through the lamination process, the stress concentration factor could be reduced drastically, indicating an improvement in structural performance. Author

N86-15351# Naval Surface Weapons Center, Silver Spring, Md.
CORROSION RESISTANT MAGNESIUM-BASED MATERIALS

FOR NAVAL APPLICATIONS
W. A. Ferrando 1 Apr. 1985 39 p
(AD-A158012; NSWC/TR-85-88) Avail: NTIS HC A03/MF A01 CSCL 11/4

This report reviews the corrosion related properties of magnesium, magnesium alloys, and magnesium based composites. It attempts to place in perspective the corrosion behavior limitations of these materials in environments likely experienced by naval systems. These are treated from both macro- and microscopic perspectives. The role of base metal impurities is investigated. The strengths and limitations of the more traditional corrosion protection methods are discussed. Some modern non-paint surface treatments and still experimental anticorrosion surface modification techniques are assessed for magnesium. Special emphasis is given to the magnesium-graphite fiber composite system, identified as unique for certain space satellite applications by virtue of its very high stiffness, near zero coefficient of thermal expansion (CTE), and high electrical conductivity. Some evidence of potential corrosion problems with this composite material in the prelaunch environment and a mechanism possibly responsible for this are presented. Relatively brief discussion is devoted to achieving the desirable properties of Gr/Mg composites using alternative materials. Finally some recommendations are made for corrosion protection of magnesium-based materials for naval systems in light of recent research efforts. Additional consideration again is given to the potentially important Gr/Mg composite system. GRA

N86-15352# Department of the Army, Washington, D. C.
METALLOGRAPHIC PREPARATION OF PARTICULATE FILLED ALUMINUM METAL MATRIX COMPOSITE MATERIAL Patent Application
E. L. Goodwin, inventor (to Army) Filed 24 Jun. 1985 10 p
(AD-D011862; US-Patent-Appl-SN-747741) Avail: NTIS HC A02/MF A01 CSCL 11/4

In accordance with this invention, a metallographic preparation method is disclosed for the preparation of particulate filled aluminum metal matrix composite material having approximately 25% silicon therein. The method includes first cutting the sample to size, mounting the sample in a plastic to provide a holder for the sample, then rough grinding the sample on a belt grinder, next fine grinding the sample on a multiplicity of different grit size silicon carbide paper, rough polishing the sample after fine grinding using a flat aluminum wheel with nylon polishing cloth and diamond bort paste thereon and finally final polishing the sample using a three-step final polishing procedure to produce a sample of fine quality which is ready for microscopic examination to determine quality and completeness of the polishing method. GRA

N86-15353# Aeronautical Research Labs., Melbourne (Australia).
THE AIRLIFT DILEMMA: AN UPDATE
E. M. Bullard May 1985 54 p
(AD-A159307; AD-F250300; AU-AWC-85-030) Avail: NTIS HC A04/MF A01 CSCL 15/5

The US, in order to protect its security, must be able to support its forces currently forward deployed as well as projecting other military forces into regions of the world where they do not exist. Time has become a critical factor because of the rapid mobility of modern armed forces and especially for the US because of its geographic isolation from most of the world. Transport by air becomes the only available method of movement during the early stages of conflict. In order to satisfy that requirement, an airlift force structure must be capable of not only meeting the time constraints, but be capable of carrying a combat unit from its origin to its employment area. The current airlift force does not have this capability. After examining doctrinal and strategic principles, this report recommends a force structure which responds to our national military strategy. First, it recommends modernization of the tactical airlift fore through purchase of newer model C-130 aircraft from a production line which is still open. Second, it recommends the purchase of a long-range C-17 type aircraft which, through its method of direct delivery, can avoid the traditional hub and spoke transportation system and save precious reaction time. Author (GRA)

N86-15347# Joint Publications Research Service, Arlington, Va.
ENERGY FUNCTION AND CONDUCTIVITY OF METAL-POLYMER COMPOSITES
O. N. Khitrova, A. M. Danyushina, Yu. S. Mardashev, and B. V. Yerofeyev *In its* USSR Report: Chemistry (JPRS-UCH-85-013) 22 Oct. 1985 p 49-50 Transl. into ENGLISH from Vestsi Akademii Navuk BSSR: Seryya Khimichnykh Navuk (Minsk, USSR), no. 3, May-Jun. 1985 p 105-106 (For primary document see N86-15344 06-23)
Avail: NTIS HC A04/MF A01

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N86-15354 Defence Research Information Centre, Orpington (England).
ELECTROCHEMICAL GAS SENSORS AND GAS ANALYSIS EQUIPMENT
Harald Boehm May 1985 27 p refs Transl. into ENGLISH from Techniches Messen (West Germany), v. 50, no. 11, 1983 p 399-406
(DRIC-T-7521; BR95923) Copyright. Avail: NTIS HC A03/MF A01

Electrochemical processes for the chemical analysis of gases are described. A distinction between direct processes, based on the application of gas diffusion electrodes, and indirect processes, where gases are dissolved or undergo a reaction in a prior step is made. Author (ESA)

N86-15355# Oak Ridge National Lab., Tenn.
TIME DEPENDENT RATE THEORY FOR DIFFUSIONAL DEFECT PROCESSES
A. D. Brailsford and L. K. Mansur Jan. 1985 53 p refs
(ORNL-6122) Avail: NTIS HC A04/MF A01

Effective Medium Theory is used to derive the equation governing the time evolution of the volume averaged defect concentration in a system containing cavities and dislocations. Any generation of defects due to external causes is assumed to be spatially homogeneous but may vary with time in an arbitrary manner. Within the approximation of spatial uniformity the theory is suitable for application to the study of irradiation effects in fusion reactor components. Specific examples of the general formalism are analyzed in detail. These indicate that although differences do exist between the present theory and that which would be inferred from a simple extension of steady state considerations, such departures are of minor practical significance. The formalism also permits a more detailed justification of steady state growth models to be given than has heretofore been available. The main emphasis for irradiated materials is placed upon the domain where instrinsic recombination between interstitials and vacancies is a minor source of defect loss. However, a brief discussion of this process is appended in order to cast it within the present formalism. Author

N86-15356# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
A CASCADE DIFFUSION THEORY OF SINK CAPTURE FLUCTUATIONS DURING IRRADIATION OF A SOLID
L. K. Mansur, A. D. Brailsford (Ford Motor Company, Dearborn, Mich.), and W. A. Coghlan (Arizona State Univ., Tempe) Jan. 1985 72 p refs Sponsored in part by Ford Motor Co.
(Contract DE-AC05-84OR-21400)
(ORNL-6123) Avail: NTIS HC A04/MF A01

Fluctuations in the number of defects captured by sinks in an irradiated solid, that arise because of the stochastic nature of collision cascade events, are analyzed. Two types of sinks are considered, cavities (or voids) and dislocations. The importance of the physical size of the sink is emphasized, as also is the magnitude of the fluctuations in defect capture relative to the behavior of its statistical mean. In particular, it is shown that the ratio of the variance to the mean, for either a cavity or a dislocation segment, decreases rapidly as overall steady state is approached. Further analytical and computational aspects of a shell model are analyzed. The relationship of this model to a truly random system is established, and additional calculations are presented to exemplify some of the features predicted by the mathematical analysis. Important functions describing the spatial origins of the point defects contributing to the average concentration and flux are described. The probabilities of special types of cascade coincidences are developed. The application of the present formalism to the problems of void nucleation, and dislocation climb over localized obstacles, in irradiated solids is indicated. Author

N86-15357# National Bureau of Standards, Washington, D.C.
STANDARD X-RAY DIFFRACTION POWDER PATTERNS Final Report
Marlene C. Morris, Howard F. McMurdie, Eloise H. Evans, Boris Paretzkin, Harry S. Parker, Winnie Wong-Ng, Donna M. Gladhill, and Camden R. Hubbard Sep. 1985 144 p refs Prepared in cooperation with International Center for Diffraction Data, Swathmore, Pa.
(NBS/MN-25-Sec-21; LC-53-61386) Avail: NTIS HC A07/MF A01

Standard X-ray powder diffraction patterns are presented for 92 substances. These patterns are useful for identification and are obtained by automated diffractometer methods. The lattice constants from the experimental work were refined by least-squares methods, and reflections were assigned hk lambda indices consistent with space group extinctions. Relative intensities, calculated densities, literature references, and other relevant data are included. E.A.K.

N86-15358*# Research Triangle Inst., Research Triangle Park, N.C.
COLLECTION AND ANALYSIS OF NASA CLEAN ROOM AIR SAMPLES Final Report
Linda S. Sheldon and Jeffrey Keever Washington NASA Nov. 1985 63 p refs
(NASA Order L-78258B)
(NASA-CR-3947; NAS 1.26:3947) Avail: NTIS HC A04/MF A01 CSCL 07D

The environment of the HALOE assembly clean room at NASA Langley Research Center is analyzed to determine the background levels of airborne organic compounds. Sampling is accomplished by pumping the clean room air through absorbing cartridges. For volatile organics, cartridges are thermally desorbed and then analyzed by gas chromatography and mass spectrometry, compounds are identified by searching the EPA/NIH data base using an interactive operator INCOS computer search algorithm. For semivolatile organics, cartridges are solvent entracted and concentrated extracts are analyzed by gas chromatography-electron capture detection, compound identification is made by matching gas chromatogram retention times with known standards. The detection limits for the semivolatile organics are; 0.89 ng cu m for dioctylphlhalate (DOP) and 1.6 ng cu m for polychlorinated biphenyls (PCB). The detection limit for volatile organics ranges from 1 to 50 parts per trillion. Only trace quantities of organics are detected, the DOP levels do not exceed 2.5 ng cu m and the PCB levels do not exceed 454 ng cu m. Author

N86-15359*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE APPLICATION OF DIFFUSION THEORY TO THE ANALYSIS OF HYDROGEN DESORPTION DATA AT 25 DEG C
Merlin D. Danford Oct. 1985 27 p refs
(NASA-TM-86531; NAS 1.15:86531) Avail: NTIS HC A03/MF A01 CSCL 07D

The application of diffusion theory to the analysis of hydrogen desorption data (coulombs of H2 desorbed versus time) has been studied. From these analyses, important information concerning hydrogen solubilities and the nature of the hydrogen distributions in the metal has been obtained. Two nickel base alloys, Rene' 41 and Waspaloy, and one ferrous alloy, 4340 steel, are studied in this work. For the nickel base alloys, it is found that the hydrogen distributions after electrolytic charging conforms closely to those which would be predicted by diffusion theory. For Waspaloy samples charged at 5,000 psi, it is found that the hydrogen distributions are essentially the same as those obtained by electrolytic charging. The hydrogen distributions in electrolytically charged 4340 steel, on the other hand, are essentially uniform in nature, which would not be predicted by diffusion theory. A possible explanation has been proposed. Finally, it is found that the hydrogen desorption is completely explained by the nature of the hydrogen distribution in the metal, and that the fast hydrogen is not due to surface and sub-surface hydride formation, as was originally proposed. Author

N86-15360*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NOVEL SORBENTS FOR HIGH TEMPERATURE REGENERATIVE H2S REMOVAL Final Report
Maria Flytzani-Stephanopoulos, George R. Gavalas, Satish S. Tamhankar, and Pramod K. Sharma Oct. 1985 110 p refs
(Contracts NAS7-918; DE-AI21-83MC-20417)
(NASA-CR-176449; JPL-Pub-85-80; NAS 1.26:176449; DOE/MC-20417-1898) Avail: NTIS HC A06/MF A01 CSCL 07D

The overall objective of this program is to develop improved regenerable sorbents for the high-temperature desulfurization of coal-derived gas streams. The aim is to reduce the H2S level, preferably in a single-stage, from 0.5 to 1.0 mol% down to 1 ppm. The specific objectives of this project are to synthesize, characterize, and test two classes of sorbents. One consists of eutectic mixtures of metal oxides (e.g., ZnO-V2O5, CuMoO4-MoO3) in the form of a melt coating the pore surface of a high surface area solid support. The second class of sorbents includes unsupported mixed oxides, in the form of solid solutions or solid compounds, e.g., Zn-Fex-Oy, Cu-Fex-Oy, prepared as highly dispersed microcrystalline solids. The principal characteristics of both classes of sorbents are rapid kinetics of absorption, high absorption capacity, and good regenerability. The rapid absorption kinetics are realized by eliminating or minimizing the resistance associated with solid state diffusion. With these properties, the sorbents would be suitable for coal gasification/molten carbonate fuel cell (MCFC) applications, but could also be applied to combined cycle power generation and the purification of synthesis gas. Author

N86-15361# Arizona State Univ., Tempe.
MECHANISMS OF EXCITATION AND IONIZATION PROCESSES IN SPUTTERING Final Report, 1 Sep. 1981 - 28 Feb. 1985
I. S. T. Tsong 7 Aug. 1985 5 p
(Contract N00014-81-K-0844)
(AD-A158061) Avail: NTIS HC A02/MF A01 CSCL 07/4

The primary objective of our research project is to understand the basic mechanisms governing the inelastic outershell processes, i.e., excitation, ionization and neutralization, in particle-solid interactions. To this end, we direct our investigation of the particles sputtered when a solid surface is subjected to energetic ion bombardment. An understanding of the basic mechanisms will allow better interpretation of experimental data obtained by surface analytical techniques which make use of sputtering such as secondary ion mass spectrometry (SIMS), auger electron spectrometry (AES) and X-ray photoemission spectrometry (XPS). These techniques are commonly used to study microelectronics problems concerning interfairal properties and diffusion of dopants and impurities. Author (GRA)

N86-15362# Cornell Univ., Ithaca, N.Y.
CRYOGENIC SAMPLE STAGE FOR THE CAMECA IMS-3F ION MICROSCOPE Interim Technical Report
M. T. Bernius, S. Chandra, and G. H. Morrison 17 Jul. 1985 7 p
(Contract N00014-80-C-0538)
(AD-A158071; AD-F630692; TR-14) Avail: NTIS HC A02/MF A01 CSCL 07/4

A liquid nitrogen cooled sample stage for use with the CAMECA-IMS-3F ion microscope has been designed, built and incorporated into the existing laboratory instrumentation for SIMS analysis of samples at cryogenic temperatures. This is particularly useful for the ion microscopic analysis of frozen hydrated samples (biologicals), and the study of sputter and ion yields of materials in a water matrix. The application to semiconductor analysis is being explored. GRA

N86-15363# New Mexico Univ., Albuquerque. School of Medicine.
ULTRASENSITIVE DETECTION OF CHEMICAL SUBSTANCES Quarterly Report, 1 Mar. - 31 May 1985
R. G. Dean 31 May 1985 8 p
(Contract N00014-82-K-0690; ARPA Order 4507)
(AD-A158224) Avail: NTIS HC A02/MF A01 CSCL 06/1

During the past quarter, we have produced and cloned several hybridomas with antibody against AChE or ACnE-DFP conjugate. One of these antibodies, designed V16-6B, has special interest. As expected this antibody binds the AChE-DFP conjugate effectively and shows a lowered cross reaction with AChE alone. The remarkable feature of the antibody is that it does not appear to bind DFP significantly. Figure 1 shows the protective effect V16-6B has in inhibiting the inactivation of AChE by decreasing amounts of DFP. Normally, DFP will activate AChE rapidly, However, if an agent such as an antibody is introduced which binds DFP then the reaction between AChE and DFP will be slowed. This data is very preliminary and requires a number of further control experiments. These will include more accurate quantization of the antibody so that molar ratios and equilibrium binding conditions can be better established and control conditions include a protein such as non-reactive Goat IgG. This data does suggest, however, that V16-6B may be directed against an AChE site which changes determinant form of conformation when DFP binding takes place and that this site is probably not located at the active site of AChE. That AChE should have been a determinant site that changes its conformation when irreversibly bound to DFP is not surprising. This data is very interesting and suggest possibilities of detecting a wide variety of potential toxins that inactivate AChE. GRA

N86-15364# Geo-Centers, Inc., Newton, Mass.
ELECTROLYSIS OF CO(2) BY NOVEL METALLOPOLYMERIC CATHODES
Mar. 1985 53 p
(Contract N00014-83-C-0690)
(AD-A158228; GC-TR-85-426) Avail: NTIS HC A04/MF A01 CSCL 07/4

One of the most critical requirements for the maintenance of a suitable atmosphere for human occupancy in a closed environment is the elimination of carbon dioxide (CO2) from ambient air. Technology is presently available for large-scale conversion of CO2. In a typically electrolysis unit, CO2 is pre-concentrated in aqueous solution then fed into a stacked assembly of alternating current collectors, solid polymer electrolyte separators and cathodes arranged in a flow-through configuration. Part 1 describes the investigation of the quantitative electrochemical response characteristics of selected metal and semiconductor electrodes with regard to CO2 reduction in nonaqueous solution. Part 2 describes the electrochemistry of a large family of monomeric and dimeric palladium and platinum phosphine complexes which are promising CO2 reduction catalysts. Part 3 describes the work performed on two chemical systems which can serve as both chelating agents and menas of immobilizing catalytic metal complexes onto an electrode surface. One system involves the di(styryl) bipyridine ligand, metal complexes of which can be attached to surfaces by electromechanical polymerization. The second system is a soluable bipyridine-ligand containing polyester, which can be evaporatively deposited onto a surface with or without a chelated metal complex catalyst. GRA

N86-15365# Naval Postgraduate School, Monterey, Calif.
PRELIMINARY RESULTS OF VELOCITIES AND DECELERATION OF ALUMINUM, MAGNESIUM, ZIRCONIUM, TANTALUM, PYROFUZE AND TITANIUM PARTICLES BURNING IN STEAM Contractor Report, Dec. 1984 - May 1985
J. Kol, Y. Chozev, and M. Berger Jul. 1985 31 p
(AD-A159141; NPS67-85-005CR) Avail: NTIS HC A03/MF A01 CSCL 21/2

The energy released by metals burning in steam has several important applications including torpedo propulsion, nuclear reactor safety, underwater vehicles, underwater ordnance, etc. For investigation of shaped charge performance, velocities and decelerations of the burning particles are important parameters that can be used for aerodynamic drag studies as well as for studies of different burning mechanisms. Wires of various metals were exploded in a steam atmosphere. The metals investigated were aluminum, magnesium, tantalum, zirconium, pyrofuze, and titanium. Exploding wires generated numerous hot, small particles. Using high speed photography, velocities and decelerations were measured. Typical results are as follows: aluminum particles initial velocity 26 + or - 0.74 m/s and deceleration of 8075 m/sq. s zirconium (ejected from 1 mm diameter wire) particles initial velocity is from 5 to 11 + or - 0.47 m/s and deceleration is from 200 to 635 m/sq. s; zirconium (ejected from 0.127 mm diameter wire) particles initial velocity is from 1.25 to 1.6 + or - 0.47 m/s and acceleration 16 m/sq. s; magnesium particles initial velocity from 27 to 34 + or - 0.43 m/s and deceleration from 3300 to 6750 m/sq. s; tantalum (ejected from 1 mm diameter wire) particles initial velocity is 5.9 + or - 0.74 m/s; pyrofuze (ejected from 0.5 mm diameter wire) particles initial velocity is from 1.25 to 1.6 + or - 0.74 m/s and deceleration from 3700 to acceleration of 200 m/sq. s; titanium titanium (ejected from 0.127 mm diameter wire) particles initial velocity is 0.6 + or - 0.43 m/s and acceleration of 15 m/sq. s. GRA

N86-15366# Naval Postgraduate School, Monterey, Calif.
BURNING TIME AND SIZE OF ALUMINUM, MAGNESIUM, ZIRCONIUM, TANTALUM, AND PYROFUZE PARTICLES BURNING IN STEAM Contractor's Report, Nov. 1984 - Mar. 1985
J. Kol and Y. Chozev Jul. 1985 33 p
(AD-A159161; NPS67-85-003CR) Avail: NTIS HC A03/MF A01 CSCL 21/2

The energy released by metals burning in steam has several important applications including torpedo propulsion, nuclear reactor safety, underwater vehicles, underwater ordnance, etc. This report continues the studies that were performed by Hallenbeck and Kol, Fuhs and Berger which are related to underwater shaped charge investigations. Wires of various metals were exploded in a steam atmosphere. The metals investigated were aluminum, magnesium, tantalum, zirconium, and pyrofuze. Exploding wires generated numerous hot, small particles. Using photography, the burning time and particle sizes were measured. Typical results are as follows: 125 + or - 25 micron diameter aluminum burns in 3.8 + or - .75 ms; 175 + or - 35 micron diameter magnesium burns in 3.8 + or - .75 ms; 125 + or - 25 micron diameter zirconium in 25 to 31 ms; 125 + or - 25 micron diameter tantalum in 24 to 50 ms; and 125 + or - 25 micron pyrofuze in 30 to 50 ms. The atmosphere was pure saturated steam at approximately 20 psig. GRA

N86-15367# Southeastern Center for Electrical Engineering Education, Inc., St. Cloud, Fla.
PREDICTIVE MODELS FOR GASEOUS-PHASE CARBON ADSORPTION AND HUMIDITY EFFECTS ON TRICHLOROETHYLENE ADSORPTION Final Report, Jun. - Aug. 1984
M. D. Werner, R. L. Gross, and E. C. Heyse Aug. 1985 50 p
(Contract F49620-82-C-0035)
(AD-A159167; AFESC/ESL-TR-85-29) Avail: NTIS

HC A03/MF A01 CSCL 07/1

Theoretical models were applied to the adsorption of trichloroethylene (TCE) at influent concentrations ranging from 300 to 1350 mg/cum in air on granular activated carbon at low relative humidity. The models are shown to predict both the adsorptive capacity of activated carbon (maximum error < 8 percent). These low humidity data were then compared to TCE absorption by the same carbon at 25, 50, 65, and 85 percent relative humidities. Increasing levels of humidity had increasingly deleterious effects on the absorptive capacity of activated carbon at all TCE concentrations tested. The adverse effect caused by the presence of water vapor was more significant at the lower TCE concentrations than at the higher concentrations. The presence of water vapor not only decreased the carbon's absorptive capacity but also reduced its efficiency by increasing the dispersion of the breakthrough curve. Data at all humidity levels fit the Dubinin-Polanyi Isotherm equation equally well, indicating that the impact of water vapor on the adsorptive capacity of carbon for TCE is predictable and could be accurately modeled. GRA

N86-15368# Ballistic Research Labs., Aberdeen Proving Ground, Md.

CRITICAL ANALYSIS OF NITRAMINE DECOMPOSITION DATA: PRODUCT DISTRIBUTIONS FROM HMX AND RDX DECOMPOSITION Final Report

M. A. Schroeder Jun. 1985 116 p

(DA Proj. 1L1-61102-AH-43)

(AD-A159325; BRL-TR-2659) Avail: NTIS HC A06/MF A01 CSCL 21/2

A summary of a critical interpretative literature review on product distributions from HMX and RDX decomposition is presented. Principal products formed include N2O, N2, H2CO, CO, CO2, and NO; these and a number of other products such as HCN, HCOOH, NO2(-), NO3(-), hydroxymethyl formamide, H2, and H2O are tabulated. NO2 appears to be formed, but is so reactive that many failures to report it may well be due to the fact that is disappears too rapidly due to further reaction. Relative amounts of HCN and NO2 may increase at high temperature, while H2CO, etc., decreases. A discussion of the first step of the decomposition is presented. A discussion of some possible unimolecular and bimolecular follow-up steps is also presented; among other things the N2/N20 ratio and some possible mechanisms for formation of molecular nitrogen (N2) are discussed. In conclusion, it is pointed out that possibly the most useful aspect of thermal decomposition studies at low temperatures and pressures is to elucidate the types of chemical deposition processes involved, including minor (at low temperatures and pressures) pathways, in addition to the principal ones. Informed extension of this body of knowledge to combustion conditions could then provide the basis for improved understanding and control of combustion processes and operational properties such as stability, sensitivity, and burning rate behavior. GRA

N86-15369# Ballistic Research Labs., Aberdeen Proving Ground, Md.

FLASH X-RAY WITH IMAGE ENHANCEMENT APPLIED TO COMBUSTION EVENTS Memorandum Report, Jan. 1983 - Jan. 1984

K. J. White and D. G. McCoy Aug. 1985 50 p

(DA Proj. 1L1-61102-AH-43)

(AD-A159328; BRL-MR-3457) Avail: NTIS HC A03/MF A01 CSCL 14/5

Flow visualization of interior ballistic processes by use of X-ray has placed more stringent requirements on flash X-ray techniques. The problem of improving radiographic contrast of propellants in X-ray transparent chambers has been studied by devising techniques for evaluating, measuring and reducing the effects of scattering from both the test object and structures in the test area. X-ray film and processing is reviewed and techniques for evaluating and calibrating these are outlined. Finally, after X-ray techniques have been optimized, the application of image enhancement processing which can improve image quality is described. This technique has been applied to X-ray studies for the combustion of Very High Buring Rate (VHBR) propellants and stick propellant charges. GRA

N86-15370# Department of Energy, Washington, D. C.

OPTICAL EMISSION LINE MONITOR WITH BACKGROUND OBSERVATION AND CANCELLATION Patent Application

D. R. Goff, inventors (to DOE) and J. E. Notestein Filed 4 Jan. 1985 15 p Sponsored by DOE

(DE85-017745; US-Patent-Appl-SN-688670) Avail: NTIS HC A02/MF A01

A fiber optics based optical emission line monitoring system is provided in which selected spectral emission lines, such as the sodium D-line emission in coal combustion, may be detected in the presence of interferring background or blackbody radiation with emissions much greater in intensity than that of the emission line being detected. A bifurcated fiber optic light guide is adapted at the end of one branch to view the combustion light which is guided to a first bandpass filter, adapted to the common trunk end of the fiber. A portion of the light is reflected back through the common trunk portion of the fiber to a second bandpass filter adapted to the end of the other branch of the fiber. The first filter bandpass is centered at a wavelength corresponding to the emission line to be detected with a bandwidth of about three nanometers (nm). The second filter is centered at the same wavelength but having a width of about 10 nm. First and second light detectors are located to view the light passing through the first and second filters respectively. Thus, the second detector is blind to the light corresponding to the emission line of interest detected by the first detector and the difference between the two detector outputs is uniquely indicative of the intensity of only the combustion flame emission of interest. DOE

N86-15424# Hokkaido Univ., Sapporo (Japan).

THE CATALYTIC ACTIVITY AND SELECTIVITY OF CHEMICAL TREATED CLINOPTILOLITE IN THE CONVERSION OF METHANOL

Harumi Sakou, Masahiro Nitta, and Kazuo Aomura *In its* Bulletin of the Faculty of Engineering, Hokkaido Univ., No. 128 Oct. 1985 25 p refs In JAPANESE; ENGLISH summary (For primary document see N86-15420 06-31)

Avail: NTIS HC A06/MF A01

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N86-15371 United Kingdom Atomic Energy Authority, Risley (England).

TIN HARD COATING BY REACTIVE ION-PLATING

H. Shimada (Toyota Central R&D Lab., Inc.) 13 Sep. 1985 10 p refs Transl. into ENGLISH from Kinzoku Hyomen Gijutsu (Japan), v. 35, no. 1, 1984 p 67-70

(BLL-Risley-Tr-5112-(9091.9F)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

A glow discharge was generated in reactive ion-plating around the substrate at low pressure with ample ion production by using a probe current in the abnormal discharge region by the ARE method. The TiN lattice constant and TiN crystallographic orientation, which depend on the glow discharge current in the substrate and nitrogen concentration, were dependent on probe current, and this was interpreted as an ion effect. The wear resistance and cohesion of the TiN hard coating, evaluated by comparison of the results of cutting tests with treated and untreated tools using a throw-away tip of SKH-4 high-speed steel, was demonstrated by prolongation of tool service life. B.W.

N86-15372 Lehigh Univ., Bethlehem, Pa.

APPLICATION OF FRACTURE MECHANICS PRINCIPLES TO FATIGUE CRACK GROWTH IN A POWDER METALLURGY NI-BASE SUPERALLOY Ph.D. Thesis

Robert Scott Vecchio 1985 208 p

Avail: Univ. Microfilms Order No. DA8516264

The fatigue crack propagation response of hot isostatically pressed (HIP) L.C. Astroloy was examined as a function of grain size, various loading parameters, crack configurations and temperature. Results for material with average grain sizes ranging from 5 micrometer to 50 micrometers are presented. Long crack near threshold FCP behavior obtained using disc compact tension (DC(T)) specimens was found to be relatively insensitive to changes in grain size at a stress ratio of 0.1. Increasing the stress ratio to 0.5 revealed an increase in FCP rates with increasing grain size. Of greater significance, however, was the observation that crack growth rates in region 1 were highly sensitive to variations in specimen geometry. At a given stress intensity range, fatigue crack growth rates were observed to increase as the loading of a given geometry became more symmetric with respect to the crack plane. It is suggested that this phenomenon is related to differing near field crack tip stress distributions between specimen geometries and their interaction with the material's microstructure.

Dissert. Abstr.

N86-15373 Illinois Inst. of Tech., Chicago.

MECHANICAL PROPERTIES AND DEFORMATION BEHAVIOR OF MARTENSITE-FERRITE DUAL-PHASE STEELS Ph.D. Thesis

Chuen-Taur Wu 1985 260 p refs

Avail: Univ. Microfilms Order No. DA8517589

The martensite-ferrite dual-phase (DP) steels were produced using a rapid resistance heating method. Starting with a commercial cold drawn 1018 pearlitic structure, DP steels with a variety of properties were obtained depending upon the dislocation structure of the ferrite matrix in combination with the carbon content and volume fraction of the martensite. A strength maximum accompanied by a ductility trough for these DP steels was observed at 34 percent martensite by volume. The structure-property relationships of the DP steels were studied in terms of the effects of the amount of martensite and its carbon content as well as the changes in ferrite properties. The strength maximum was reconciled in terms of the combined effect of increasing amounts of martensite with accompanying lowering of the strength (carbon content) of the martensite as a function of increasing intercritical heat treatment temperature for this single grade of steel. Dissert. Abstr.

N86-15374 Drexel Univ., Philadelphia, Pa.

MELTING AND CONSOLIDATION OF NICKEL ALLOY POWDERS WITH A PLASMA JET OPERATING IN A LOW PRESSURE INERT ENVIRONMENT Ph.D. Thesis

Ronald William Smith 1985 332 p

Avail: Univ. Microfilms Order No. DA8517065

Plasma deposition powder consolidation was conducted on a series of nickel alloys deposited using two plasma jets of largely different enthalpy and velocity distributions. The deposits were studied for density changes and structure changes as a function of powder composition and plasma jet condition. The powder consolidation mechanisms were observed and compared to mechanisms in conventional P/M. The melting of particles in the plasma was observed and the mechanism of melting was compared to current melting models for plasma deposition. Deposit density was increased by using a higher enthalpy, lower velocity distribution plasma jet. Compositions and powder structures have been shown to affect density. Pure elements (Ni) or eutectic composition (Ni50Cr) powder required hotter jets or trajectories were more sensitive to deposit conditions than alloy powder with wider melting ranges. Unmelted powder particles were found in all deposits resulting from the process variables and powder distributions.

Dissert. Abstr.

N86-15375 Carnegie-Mellon Univ., Pittsburgh, Pa.

THE ROLE OF MICROSTRUCTURE IN HYDROGEN-ASSISTED CRACK INITIATION IN HIGH STRENGTH STEELS Ph.D. Thesis

William Joseph Sisak 1985 192 p

Avail: Univ. Microfilms Order No. DA8517533

The effect of hydrogen on crack initiation in lower bainite and tempered martensite was investigated in two high strength steels, 9Ni-4Co and 4140. Crack initiation was studied in both uncharged and hydrogen precharged notched bend specimens. Crack initiation in uncharged single-edge-notched bend bars with polished notch surfaces occurred at a constant NOD, independent of yield strength and strain-hardening exponent. Strain localization at the notch surface was controlled by the grain size and was a precursor to crack initiation. Crack initiation occurred beneath the notch in most hydrogen precharged specimens at a relatively constant macroscopic stress of 1820 MPa. Lower bainite and tempered martensite generally exhibited similar susceptibility to hydrogen-assisted crack initiation. However, martensite tempered at 595 C exhibited the best resistance to hydrogen. The increased resistance to hydrogen-assisted crack initiation was attributed to the presence of (Mo,V) sub 2 C carbides in this microstructure. Dissert. Abstr.

N86-15376 Ohio State Univ., Columbus.

COMBINED MODE 1 - MODE 3 FRACTURE TOUGHNESS OF HIGH-STRENGTH LOW-ALLOY STEEL Ph.D. Thesis

James Gregory Schroth 1985 211 p

Avail: Univ. Microfilms Order No. DA8519022

Combined mode 1 - mode 3 fracture behavior was investigated for two heat treated conditions of a copper-bearing high-strength low-alloy steel. Special formulations of the J integral, denoted J sub 1 and J sub 3 for the opening mode and transverse shear mode respectively, were used to characterize crack initiation while Paris' tearing modulus was used to characterize J-resistance behavior during stable crack extension. Combined mode fracture initiation data define a linear fracture envelope in J sub 1 - J sub 3 space. This behavior is predicted qualitatively by a superdislocation model of combined mode elastic-plastic fracture in which the plastic zone is modeled by two superdislocations ahead of the crack tip; one of edge character with Burgers vector equal to the model CTOD, the other of screw configuration with Burgers vector equal to the model 3 CTOD. For all loading modes, the overaged condition containing incoherent face-centered-cubic copper precipitates exhibited superior toughness as compared to the peak aged condition which had a similar grain size and carbide distribution, but contained coherent body-centered-cubic copper-containing clusters. Dissert. Abstr.

N86-15377 Connecticut Univ., Storrs.

CRYSTALLOGRAPHIC FATIGUE CRACK PROPAGATION IN SINGLE CRYSTAL NICKEL-BASE SUPERALLOY Ph.D. Thesis

Otis Yuchia Chen 1985 228 p

Avail: Univ. Microfilms Order No. DA8516178

A study of the fatigue crack propagation behavior of single crystal nickel-base superalloy MAR-M200 (Ni-9Cr-10Co-12W-1Nb-2Ti-5A1) was conducted in order to gain a detailed understanding of how fatigue cracks propagate along crystallographic planes. This included both the study of Stage 1 fatigue crack propagation using conventional compact-type (C-T) specimens and four-point loading specimens specially designed to achieve a pure cyclic shear condition. A two dimensional Boundary Integral Equation (BIE) method was used to calculate both the shear stress intensity factor (K sub 11) and the tensile stress intensity factor (K sub 1) of C-T specimens with angled cracks as well as for pure shear specimens in four-point loading. It was observed that crystallographic fatigue crack propagation occurred exclusively along octahedral (111) planes and was independent of the specimen crystallographic orientations. For the first time, it has been demonstrated that fatigue cracks propagate along crystallographic planes subject to pure cyclic shear loading. Dissert. Abstr.

N86-15378*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THERMAL-MECHANICAL FATIGUE TEST APPARATUS FOR METAL MATRIX COMPOSITES AND JOINT ATTACHMENTS

Leonard J. Westfall and Donald W. Petrasek 1985 21 p refs Presented at 1st Symposium on Testing Technology of Metal Matrix Composites, Nashville, Tenn., 18-20 Nov. 1985; sponsored by American Society for Testing and Materials

(NASA-TM-87187; E-2773; NAS 1.15:87187) Avail: NTIS

HC A02/MF A01 CSCL 11F

Two thermal-mechanical fatigue (TMF) test facilities were designed and developed, one to test tungsten fiber reinforced metal matrix composite specimens at temperature up to 1430C (2600F) and another to test composite/metal attachment bond joints at temperatures up to 760C (1400 F). The TMF facility designed for testing tungsten fiber reinforced metal matrix composites permits test specimen temperature excursions from room temperature to 1430C (2600F) with controlled heating and loading rates. A strain-measuring device measures the strain in the test section of the specimen during each heating and cooling cycle with superimposed loads. Data is collected and recorded by a computer. The second facility is designed to test composite/metal attachment bond joints and to permit heating to a maximum temperature of 760C (1400F) within 10 min and cooling to 150C (300F) within 3 min. A computer controls specimen temperature and load cycling. Author

N86-15379*# National Aeronautics and Space Administration, Washington, D.C.

FLUIDIZED REDUCTION OF OXIDES ON FINE METAL POWDERS WITHOUT SINTERING

T. Hayashi Nov. 1985 8 p Transl. into ENGLISH of Japanese Patent no. 59-116302 (Appl. no. Sho-5-7-208500, 30 Nov. 1982) p 1-3 Transl. by Scientific Translation Service, Santa Barbara, Calif.

(Contract NASw-4004)

(NASA-TM-77928; NAS 1.15:77928) Avail: NTIS HC A02/MF A01 CSCL 11F

In the process of reducing extremely fine metal particles (av. particle size < or = 1000 angstroms) covered with an oxide layer, the metal particles are fluidized by a gas flow contg. H, heated, and reduced. The method uniformly and easily reduces surface oxide layers of the extremely fine metal particles without causing sintering. The metal particles are useful for magnetic recording materials, conductive paste, powder metallurgy materials, chem. reagents, and catalysts. Author

N86-15380*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CREEP RUPTURE BEHAVIOR OF STIRLING ENGINE MATERIALS

R. H. Titran, C. M. Scheuerman, and J. R. Stephens [Oct. 1985] 10 p refs Presented at the Advanced Technology Development Contractors Coordination Meeting, Dearborn, Mich., 21-24 Oct. 1985; sponsored by DOE

(Contract DE-AI01-77CS-51044)

(NASA-TM-87209; E-2846; DOE/NASA/51044-37; NAS 1.15:87209) Avail: NTIS HC A02/MF A01 CSCL 11F

The automotive Stirling engine, being investigated jointly by the Department of Energy and NASA Lewis as an alternate to the internal combustion engine, uses high-pressure hydrogen as the working fluid. The long-term effects of hydrogen on the high temperature strength properties of materials is relatively unknown. This is especially true for the newly developed low-cost iron base alloy NASAUT 4G-A1. This iron-base alloy when tested in air has creep-rupture strengths in the directionally solidified condition comparable to the cobalt base alloy HS-31. The equiaxed (investment cast) NASAUT 4G-A1 has superior creep-rupture to the equiaxed iron-base alloy XF-818 both in air and 15 MPa hydrogen. Author

N86-15381# Lockheed Missiles and Space Co., Palo Alto, Calif.

FUNDAMENTAL STUDIES ON THE ALUMINUM-LITHIUM-BERYLLIUM ALLOY SYSTEM

J. Wadsworth Jul. 1985 56 p

(Contract N00014-84-C-0032)

(AD-A158088; LMSC-F035827) Avail: NTIS HC A04/MF A01 CSCL 11/6

A considerable effort has been expended in recent years in the development of advanced aluminum alloys. Two major areas of work have evolved. The first area is directed toward the production of high modulus alloys, predominantly for use at high temperature, using rapid solidification processing (RPS) and power metallurgy (PM) consolidation. These alloys are based on the Al-Mn and Al-Fe systems. The second area, in recognition of the overriding importance of low density in weight savings in aerospace structures, is the development of low density and high modulus alloys based on the aluminum lithium system. These Al-Li alloys are predominantly manufactured using ingot metallurgy techniques although successful PM alloys have also been produced. In order to take further advantage of density decreases in aluminum alloys, it is not possible simply to continue to increase the lithium content of the alloy. Only two elemental additions to aluminum have the effect of simultaneously decreasing density and increasing the elastic modulus by significant amounts. These are lithium and beryllium; Li is both the most efficient density-decreasing and modulus-increasing of all metallic elements when added to aluminum. Rapid solidification processing (RSP) is a unique and potentially practical method for the development of high modulus and high strength microstructures in Al-Li alloys containing more than about 0.03% Be. GRA

N86-15382# Northwestern Univ., Evanston, Ill. Dept. of Materials Science.

X-RAY ELASTIC CONSTANTS AND THEIR MEANING FOR Al AND Fe

R. M. Zhong, I. C. Noyan, and J. B. Cohen Jul. 1985 7 p

(Contract N00014-80-C-0116)

(AD-A158251; TR-19) Avail: NTIS HC A02/MF A01 CSCL 11/6

In the measurement of residual stresses via diffraction (using X-rays or neutrons) it is strains that are actually determined, by employing the interplanar spacing (d subscript hkl) of the (hkl) planes as an internal strain gauge. The change in this spacing is measured from the shift of diffraction peaks (and Bragg's law) at several orientations of the sample to the incident beam, and the resultant strains are converted to stresses with the diffraction elastic constants, S subcript 1(hkl) and S subscript 2(hkl)/2. While these take on the values (-v/E) and (1 + v)/E respectively for an isotropic solid, in anisotropic materials their values depend on many factors; preferred orientation, shape and orientation of second phases, interaction between grains. In fact there are reports of variation these constants with plastic deformation 2 and theory predicts variations with morphology. It is demonstrated that the diffraction elastic constants for residual stress measurements can be determined even in the presence of oscillations in interplanar spacing vs sin squared psi. Furthermore, these values can be employed to ascertain whether the oscillations are due to local fluctuations in plastic deformation, or elastic anisotropy. GRA

N86-15383# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.

EFFECTS OF CHEMISTRY AND PROCESSING ON THE FRACTURE RELATED PROPERTIES OF P/M ALLOY CT91 Final Report, Sep. 1980 - May 1984

W. M. Griffith Aug. 1985 334 p

(DA Proj. 241-8)

(AD-A159299; AD-F250300; AFWAL-TR-84-4165) Avail: NTIS HC A15/MF A01 CSCL 11/6

With the single exception of fatigue crack propagation resistance, the development of high strength powder metallurgy (P/M) aluminum alloys has been very successful. CT91, an example of this class of alloy, has been studied to determine the effect of chemistry (Co content), deformation processing (38% and 64% uniaxial upset forging), and stress relief on engineering and fracture related properties. Stress relief by compression after solution heat treatment was found to have little effect on the properties studied and made no apparent change in the microstructure. A slight reduction in strength and slight improvement in fatigue crack propagation (FCP) resistance was noted in material that had been stress relieved. Co content had the largest effect of all program variables on strength - the 0.4% Co alloy exhibits a 28 MPa (4 ksi) increase in both ultimate and yield strength compared to the 0% Co alloy. No effect of Co content on fracture toughness or FCP resistance was observed. Changing the uniaxial forging

deformation from 38% to 64% produced no measureable effect on strength, toughness, or FCP resistance. There was a marked increase in scatter in the fracture related properties at the lower forging strain. This is attributed to the reduced degree of breakup and distribution of oxides found at the prior powder particle boundaries which provides sites for easy crack propagation. None of the major program variables had a significant effect on the Low Cycle Fatigue (LCF) behavior of the alloy. Author (GRA)

N86-15384# Department of Energy, Washington, D. C.
LOW ACTIVATION FERRITIC ALLOYS Patent Application
D. S. Gelles (Hanford Engineering Development Lab., Richland, Wash.), N. M. Ghoniem (Hanford Engineering Development Lab., Richland, Wash.), and R. W. Powell, inventors (to DOE) (Hanford Engineering Development Lab., Richland, Wash.) Filed 7 Feb. 1985 20 p
(Contract DE-AC06-76FF-02170)
(DE85-017795; US-Patent-Appl-SN-699092) Avail: NTIS HC A02/MF A01

Low activation ferritic alloys, specifically bainitic and martensitic stainless steels, are described for use in the production of structural components for nuclear fusion reactors. They are designed specifically to achieve low activation characteristics suitable for efficient waste disposal. The alloys essentially exclude molybdenum, nickel, nitrogen and niobium. Strength is achieved by substituting vanadium, tungsten, and/or tantalum in place of the usual molybdenum content in such alloys. DOE

N86-15385# Los Alamos National Lab., N. Mex.
MACH STEM CHARACTERIZATION IN Mbar DESIGNS USING RSR POWDER
K. P. Staudhammer and K. A. Johnson 1985 7 p Presented at the American Physical Society Topical Conference on Shock Waves in Condensed Matter, Spokane, Wash., 22 Jul. 1985
(Contract W-7405-eng-36)
(DE85-015700; LA-UR-85-2515; CONF-850736-59) Avail: NTIS HC A02/MF A01

Suitable selection of powders can be used as a modeling device for complicated experimental designs. The powder melt zone is clearly defined and the RSR-834 powder is reasonably well behaved. This experiment was with only one composition, size and distribution. However, it is believed that other morphologies, composition, and size distributions could result in a more complete modeling of the compaction process that would enable heuristic calculations of the combined effects of adiabatic temperature rise and entropic heating (strain/deformation). DOE

N86-15386# Argonne National Lab., Ill. Materials Science and Technology Div.
THE ROLE OF HYDROGEN EMBRITTLEMENT IN INTERGRANULAR STRESS CORROSION CRACKING OF SENSITIZED TYPE 304 STAINLESS STEEL
W. E. Ruther, T. F. Kassner, and F. A. Nichols Jun. 1985 16 p refs Presented at the 2nd International Symposium on Environmental Degradation of Materials in Nuclear Power Systems-Water Reactors, Monterey, Calif., 9-12 Sep. 1985; sponsored by ANS, AIME and NACE Sponsored in part by Nuclear Regulatory Commission, Washington, D.C.
(TI85-014965; CONF-850902-1) Avail: NTIS HC A02/MF A01

Fixed-load Mode I/Mode 3 comparative tests have been conducted on lightly sensitized (EPR - 2 C/sq cm) Type 304 SS specimens in 289 C oxygenated water with other impurity additives. Substantial susceptibility to IGSCC was shown in Mode 1 but no conclusive evidence for SCC was found in Mode 3. These results are consistent with a hydrogen embrittlement mechanism of crack advance, but electrochemical measurements seem to accord better with a slip-dissolution mechanism. Further studies are needed to clarify the operative mechanism(s). Author

N86-15387# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
TEST FOR A POSSIBLE MELTING TRANSITION IN GRAIN BOUNDARIES IN ALUMINUM NEAR THE MELTING POINT
S. W. Chan, J. S. Liu, and R. W. Balluffi Jul. 1985 6 p
(Contract DE-FG02-84ER-45116)
(DE85-013238; DOE/ER-45116/6) Avail: NTIS HC A02/MF A01

Results indicate that the near-(SIGMA)5 [100] twist and tilt boundaries did not undergo melting at temperatures as high as (0.89 + or - 0.03) T sub m and (0.93 + or - 0.03) T sub m, respectively. This result appears to be in disagreement with the calculated grain boundary melting transistions at lower values of T/T sub m. Our results are not inconsistent with calculations which suggest that a type of disordering may occur in which the boundary becomes highly defective locally while still retaining its basic crystallinity. Also, our work seems consistent with the experimental results in which the rotating crystallite method was used to demonstrate that at least many boundaries in copper remain ordered to temperatures as high as 0.97 T sub m. The cause of the grain boundary splitting phenomenon observed for the tilt boundaries near 0.94 T sub m is not completely clear. The observation of the lattice dislocation activity in the adjoining crystals suggests that stresses were present which may have caused simple fracture at the boundaries. On the other hand, the authors cannot preclude the more complex possibility that come structural change occurred at these boundaries which played an essential role in the splitting. DOE

N86-15388# Allied Bendix Aerospace, Kansas City, Mo.
MICROSTRUCTURAL EVALUATION OF 49Co-49Fe-2V ALLOY Final Report
W. S. Gibbs Jul. 1985 14 p
(Contract DE-AC04-76DP-00613)
(DE85-016500; BDX-613-3292) Avail: NTIS HC A02/MF A01

Improvements in the magnetic and mechanical properties related to machinability of 49Co-49Fe-2V alloy have been reported in current literature. Recommended heat treatments were evaluated, and torque improvment of an MC2969 solenoid assembly was realized using an 885(0) C final anneal and a slow cooling cycle. Investigation of a recommended water quenching procedure to improve ductility revealed an undersirable growth of 0.0005 mm/mm, after final heat treatment. Water quenching of bar stock is not recommended for applications at Bendix Kansas City Division (BKCD). The current literature on this alloy was reviewed and is summarized in this report. DOE

N86-15389# Ames Lab., Iowa.
PROBABILISTIC ANALYSIS OF STEEL CONTAINMENT STRENGTH WITH INTERNAL PRESSURE
L. Greimann and F. Fanous 1985 7 p Presented at the 8th International Conference on Structural Mechanics in Reactor Technology, Brussels, Belgium, 19 Aug. 1985
(Contract W-7405-eng-82)
(DE85-015520; IS-M-545; CONF-850809-74) Avail: NTIS HC A02/MF A01

Recently, there has been heightened interest in the behavior of the containments under internal pressure conditions beyond the design level. By example, the reliability analysis of the containment resistance is presented in three steps: (1) each of the basic structural parameters is described in statistical terms; (2) a structural analysis is used to relate these parameters to a failure condition; (3) the uncertainties of the basic parameters are propagated through the structural analysis to describe the failure probability and to evaluate the total uncertainty of the containment resistance. DOE

N86-15390# Combustion Engineering, Inc., Chattanooga, Tenn. Metallurgical and Materials Lab.
MICROSTRUCTURAL CONTROL TO IMPROVE THE PROPERTIES OF CHROMIUM-MOLYBDENUM WELD METAL Final Technical Report, 1 Oct. 1983 - 30 Oct. 1984
E. W. Pickering, Jr. 10 Mar. 1985 36 p
(Contract DE-AC05-84OR-21400)
(DE85-016179; DOE/OR-21400/T169; CEMML-64760-13) Avail: NTIS HC A03/MF A01

The objective of this work was to formulate and produce a variety of welding consumables for the purpose of determining

the effects of compositional and process variables on the microstructure and mechanical properties of shielded metal arc (SMA) weld metal of advanced Cr-Mo steels. Composition variables included the effect of slag basicity and oxygen potential as well as the effect of alloying elements. Welding variables included heat input, preheat and interpass temperature, and post weld heat treatments. Primary work centered on development, and supplying welding consumables, welding of test plates and related testing at both Combustion Engineering (C-E) and the Oak Ridge National Laboratory (ORNL). In addition, two experimental heats of 3Cr-1.5Mo were laboratory manufactured for use by other contractors on the Advanced Fossil Energy Materials Research and Technology Development Program. This report summarizes the work accomplished during the contract period. Electrodes were produced for 3Cr-1.5Mo-V steel with three levels of C and V, and SMA weldments were made in 1-in. thick plates. After a 6-h post weld heat treatment at 700 C the electrode producing the highest deposited C and V (0.1% for each) showed the best strength and impact properties. DOE

N86-15422# Hokkaido Univ., Sapporo (Japan).
A STUDY OF REACTIVE SPUTTER ETCHING FOR CARBON STEEL BY FREON GAS: ON THE EFFECT OF OXYGEN GAS MIXTURE
Toshio Yuhta, Jun Osanai, Toshikazu Satoh, and Tatsuo Takahashi *In its* Bulletin of the Faculty of Engineering, Hokkaido Univ., No. 128 Oct. 1985 26 p refs In JAPANESE; ENGLISH summary (For primary document see N86-15420 06-31)
Avail: NTIS HC A06/MF A01

N86-15439# Joint Publications Research Service, Arlington, Va.
HYDROGEN DIFFUSION, POSITRON ANNIHILATION IN 40CrNiMo STEEL
Du Fengmu, Gui Jianian, and Wang Zixiao *In its* China Report: Science and Technology (JPRS-CST-85-038) 5 Nov. 1985 p 34-36 refs Transl. into ENGLISH from Wuhan Dzxue Xuebao (Ziran Kexue Ban) (Wuhan), no. 2, 1984 p 95-96 (For primary document see N86-15438 06-31)
Avail: NTIS HC A06/MF A01

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N86-15391*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STUDIES OF MOLECULAR PROPERTIES OF POLYMERIC MATERIALS: AEROSPACE ENVIRONMENTAL EFFECTS ON THREE LINEAR POLYMERS Final Technical Report, 1 Nov. 1984 - 31 Oct. 1985
Wynford L. Harries (Old Dominion Univ., Norfolk, Va.), Heidi R. Ries (Old Dominion Univ., Norfolk, Va.), Cynthia A. Bradbury (Old Dominion Univ., Norfolk, Va.), Stephanie L. Gray (Old Dominion Univ., Norfolk, Va.), William D. Collins (Old Dominion Univ., Norfolk, Va.), Sheila Ann T. Long, and Edward R. Long, Jr. Dec. 1985 42 p refs
(Contract NCC1-90)
(NASA-TM-87532; NAS 1.15:87532) Avail: NTIS HC A03/MF A01 CSCL 11B

The development of crystal handling techniques for reflection infrared spectroscopy and methods for the fabrication and testing of tensile specimens are discussed. Data from mechanical, ac and dc electrical, and electron paramagnetic resonance studies conducted to determine the effects of 0.1-MeV and 1.0-MeV electron radiation on Mylar, Kapton, Ultem, and metal-doped Ultem are presented. Total doses ranging from 1 X 10 to the 8 rads to 1 X 10 to the 10 rads and dose rates from 5 X 10 to the 7 rads/hr to 1 X 10 to the 9 rads/hr were employed. The results of a study on the effects of aircraft service-environment fluids on Ultem are also reported. The weights and mechanical properties of Ultem were evaluated before and after exposure to water, JP4, Skydrol, an antifreeze, and a paint stripper. For individual titles, see N86-15392 through N86-15393.

N86-15392*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STUDIES OF MOLECULAR PROPERTIES OF POLYMERIC MATERIALS: AEROSPACE ENVIRONMENTAL EFFECTS ON THREE LINEAR POLYMERS (POLYMER DURABILITY)
In its Studies of Molecular Properties of Polymeric Materials: Aerospace Environmental Effects on Three Linear Polymers Dec. 1985 p 1-34 refs (For primary document see N86-15391 06-27)
Avail: NTIS HC A03/MF A01 CSCL 11B

Aerospace environmental effects on polymeric materials were studied. The polymers under study are being considered for use as structural materials for spacecraft and advanced aircraft. It is necessary to understand the durability of these polymers to the environment in which they are to be used. G.L.C.

N86-15393*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RADIO-FREQUENCY ELECTRICAL PROPERTIES OF SOME NEAT AND METAL-DOPED POLYIMIDES
Edward R. Long, Jr., Sheila Ann T. Long, Heidi R. Ries (Old Dominion Univ., Norfolk, Va.), and Wynford L. Harries (Old Dominion Univ., Norfolk, Va.) *In its* Studies of Molecular Properties of Polymeric Materials: Aerospace Environmental Effects on Three Linear Polymers Dec. 1985 p 35-36 (For primary document see N86-15391 06-27)
Avail: NTIS HC A03/MF A01 CSCL 11B

As the size and complexity of aerospace systems increase, the uses of polymers are also expected to increase. Polyimides constitute one promising generic class of polymeric materials. They retain good mechanical and physical properties at higher temperatures and absorb less moisture than do the epoxies, which are the polymers most frequently used in present aerospace systems. The properties of these polyimide materials are, therefore, of considerable interest to the aerospace community. Of particular importance are the electrical properties because these properties relate to both electrical and structural applications. Author

N86-15394*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TEXTURED CARBON ON COPPER: A NOVEL SURFACE WITH EXTREMELY LOW SECONDARY ELECTRON EMISSION CHARACTERISTICS
Arthur N. Curren and Kenneth A. Jensen Dec. 1985 16 p refs (NASA-TP-2543; E-2674; NAS 1.60:2543) Avail: NTIS HC A02/MF A01 CSCL 11G

Experimentally determined values of true secondary electron emission and relative values of reflected primary electron yield for a range of primary electron beam energies and beam impingement angles are presented for a series of novel textured carbon surfaces on copper substrates. (All copper surfaces used in this study were oxygen-free, high-conductivity grade). The purpose of this investigation is to provide information necessary to develop high-efficiency multistage depressed collectors (MDC's) for microwave amplifier traveling-wave tubes (TWT's) for communications and aircraft applications. To attain the highest TWT signal quality and overall efficiency, the MDC electrode surface must have low secondary electron emission characteristics. While copper is the material most commonly used for MDC electrodes, it exhibits relatively high levels of secondary electron emission unless its surface is treated for emission control. The textured carbon surface on copper substrate described in this report is a particularly promising candidate for the MDC electrode application. Samples of textured carbon surfaces on copper substrates typical of three different levels of treatment are prepared and tested for this study. The materials are tested at primary electron beam energies of 200 to 2000 eV and at direct (0 deg) to near-grazing (85 deg) beam impingement angles. True secondary electron emission and relative reflected primary electron yield characteristics of the textured surfaces are

compared with each other and with those of untreated copper. All the textured carbon surfaces on copper substrate tested exhibited sharply lower secondary electron emission characteristics than those of an untreated copper surface. Author

N86-15395*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
CHEMOVISCOSITY MODELING FOR THERMOSETTING RESINS Final Report
Surendra N. Tiwari, T. H. Hou, and J. M. Bai Nov. 1985 23 p refs
(Grant NAG1-569)
(NASA-CR-176409; NAS 1.26:176409) Avail: NTIS HC A02/MF A01 CSCL 11G

A chemoviscosity model, which describes viscosity rise profiles accurately under various cure cycles, and correlates viscosity data to the changes of physical properties associated with structural transformations of the thermosetting resin system during cure, was established. Work completed on chemoviscosity modeling for thermosetting resins is reported. E.A.K.

N86-15396*# National Aeronautics and Space Administration, Washington, D.C.
MANUFACTURE OF DENSE SINTERED BODIES CONTAINING SILICON NITRIDE
K. Hirota, Y. Hasegawa, K. Ogura, and Y. Yashima Dec. 1985 10 p Transl. into ENGLISH of Japanese Patent no. 59-111981 (Appl. no. 57-221276, 17 Nov. 1982) p 1-4 Transl. by The Corporate Word, Pittsburgh, Pa.
(Contract NASw-4006)
(NASA-TM-77929; NAS 1.15:77929) Avail: NTIS HC A02/MF A01 CSCL 11G

Sintered bodies containing 1-32.5 Si oxide and > 1.5 wt.% SiC (Si oxide/SiC wt. ratio < 3/2) are prepared and kept in a 10-3000 kg/2 sq. cm. N (g) atmosphere at 1500-2300 degrees, while simultaneously maintaining the CO (g) partial pressure around the body lower than the nitrogenation equil. pressure to give a dense sintered body. The prepared dense sintered body has high strength at high temperatures. Thus, SiC 40, oxide 30 and Si3N4 30 wt% were fired to a body which was kept in 1500 kg/sq. cm. N (g) for 20 h at 2000 degrees to give a dense sintered body having high bending strength at high temperatures. Author

N86-15397*# National Aeronautics and Space Administration, Washington, D.C.
HOT ISOSTATIC PRESSING OF CERAMICS
K. Honma Oct. 1985 10 p Transl. into ENGLISH of Japanese Patent no. 58-84713 (Appl. S56-182735, 13 Nov. 1981) p 1-5 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77931; NAS 1.15:77931) Avail: NTIS HC A02/MF A01 CSCL 11B

A mixture containing glass 70 to 95 and BN or B4C powder (0.1-10 microns) 5 to 30 vol. % is used as a secondary pressure medium in hot isostatic pressing of ceramics. Thus, Pyrex beads were mixed with 15% vol. BN powder (average diameter 2 microns), fused at 1400 deg for 2 h, cooled, crushed, and put into a graphite crucible. A Si3N4 sintered body was embedded in the powder, heated in vacuum at 1200 deg for 2 h, treated in a hot isostatic press furnace at 1700 deg and 1000 atm. for 1 h, and cooled to give a Si3N4 ceramic. It was easily separated from the crucible. Author

N86-15398# Chronos Research Labs., Inc., Olivehain, Calif.
DEMONSTRATION OF A PYROELECTRIC CONVERSION POWER CYCLE WITH A POLYMER Final Report, Oct. 1983 - Oct. 1984
R. B. Olsen Mar. 1985 54 p
(Contract F33615-83-C-2344)
(AD-A158964; AFWAL-TR-85-2011) Avail: NTIS HC A04/MF A01 CSCL 20/3

Copolymers of vinylidene fluoride trifluoroethylene P(VDF-TrFE) exhibit large piezoelectric effects. Standard isothermal D-E hysteresis loops were found to be inaccurate predictors of the pyroelectric conversion performance of this material. Conduction effects obscured the observation of conversion cycles for the presently available materials. A conversion cycle was measured with electric energy density of 30 mJ/cc, which is 15 times larger than that of any other polymer yet measured. Resistivity and displacement change data are discussed in terms of predicted pyroelectric energy conversion performance. Author (GRA)

N86-15399# Lawrence Livermore National Lab., Calif.
CALCULATING THE VULNERABILITY OF SYNTHETIC POLYMERS TO AUTOIGNITION DURING NUCLEAR FLASH Final Report
R. Hickman and T. Reitter Mar. 1985 36 p Sponsored in part by Federal Emergency Management Agency
(Contracts W-7405-eng-48; EMW-E-0883)
(AD-A159420; UCRL-53545) Avail: NTIS HC A03/MF A01 CSCL 11/9

In an experiment that was part of a 1953 nuclear test (Encore), a furnished room exposed to nuclear heat was completely consumed when the fire unexpectedly progressed to flashover. The result of this unique experiment has been called an anomaly, but a flashover under these conditions may actually be typical (and consequently worth exploration). The calculations detailed in this report represent a first approach to this question. Because synthetic polymers in the form of furnishing are more common in modern dwellings than the cellulose-based materials used in the 1953 experiment, we have emphasized the polymers in our calculations. Our investigations have virtually ruled out photochemical processes as an explanation of past or future flashovers induced by nuclear detonation. Our calculations of rapid radiant heating of a few common synthetic materials show they would quickly ignite when exposed to a 25-cal sq cm fluence from a 1-Mt weapon detonated in the air. This result, together with the fact at a higher rate during combustion, suggests that modern dwellings are vulnerable to nuclear-flash-induced flashover. A definitive answer to the question, however, must await carefully planned, full-scale experiments. GRA

N86-15400# North Carolina Univ., Chapel Hill. Dept. of Chemistry.
MICROSTRUCTURES BUILT FROM ELECTROACTIVE POLYMERS: TOWARD A MACROMOLECULAR ELECTRONICS
R. W. Murray Sep. 1985 18 p
(Contract N00014-82-K-0337)
(AD-A159430; TR-14) Avail: NTIS HC A02/MF A01 CSCL 09/1

Electrodes can be coated with electrochemically reactive polymers in several microstructural formats called sandwich, array, bilayer, microelectrode, and ion gate electrodes. These microstructures can be used to study the transport of ions through in the polymers as a function of the polymer oxidation state, which is essential to understanding the conductivity properties of these new chemical materials. The microstructures also exhibit potentially useful electrical and optical responses, including current rectification, charge and amplification, electron hole pair separation, and gates for ion flow. Author (GRA)

N86-15401# North Carolina Univ., Chapel Hill. Dept. of Chemistry.
REDOX CAPACITY AND dc ELECTRON CONDUCTIVITY IN ELECTROACTIVE MATERIALS
R. W. Murray Sep. 1985 21 p
(Contract N00014-82-K-0337)
(AD-A159431; TR-15) Avail: NTIS HC A02/MF A01 CSCL 11/9

The storage and transport of charge in electroactive materials are closely related. We develop the macroscopic concepts of redox capacity, rho, and dc electronic conductivity, sigma subscript e/rho. Their ratio, De = Sigma subscript e/rho, is identified as the electron diffusion coefficient. A microscopic model is developed incorporating interaction among the stored electrons and variation of countering activity as a function of electrochemical potential. Data

obtained for the polymer poly Os(2 ,2'-bipyridine)2(4-vinylpyridine 2 (C104) x (x = 0-3) are compared with the model. The dependence of the electron diffusion coefficient on electrochemical potential is particularly revealing of discrepancies between the real material and the model, suggesting that this quantity will be a useful parameter for the characterization of a variety of electroactive materials. Author (GRA)

N86-15402# Department of the Navy, Washington, D. C.
MOLDABLE ELECTRICALLY CONDUCTIVE POLYMER COMPOSITIONS Patent Application
O. K. Kim, inventor (to Navy) Filed 30 May 1985 16 p
(AD-D011887; US-Patent-Appl-SN-739355) Avail: NTIS HC A02/MF A01 CSCL 07/4

Accordingly, it is an object of this invention to obtain high electrical conductivity in a polymeric composition. Another object is to provide a bulky, moldable polymeric composition that conducts electricity. Another object is to provide a polymeric composition that is stable in an oxygen-rich atmosphere. Another object is to de-couple the choice of structural polymer from the choice of cation so as to allow optimization of composition properties and choice of the most economical materials. Another object is to provide a means for improving the normal structure properties of TCNQ while retaining the desirable thermal or electrical properties of any given TCNQ/salt species. The above and other objects are achieved by the present inventive method and material. A salt of 7,7,8,8-tetracyanoquinodimethane (TCNQ) and a structural polymer are dissolved in a mutual solvent. The solution is chilled and subsequently added to a liquid with which the solvent is miscible but in which the TCNQ and polymer are less soluble. A precipitate results which is a massive, conducting, moldable substance stable in atmospheric oxygen. It consists of polymer filaments coated with TCNQ microcrystals. These filiments retain many properties of the pure, crystalline TCNQ salt. GRA

N86-15403# Department of Energy, Washington, D. C.
PRODUCTION OF GLASS OR GLASS-CERAMIC TO METAL SEALS WITH THE APPLICATION OF PRESSURE Patent Application
M. D. Kelly (Monsanto Research Corp., Dayton, Ohio) and D. P. Kramer, inventors (to DOE) (Monsanto Research Corp., Dayton, Ohio) Filed 4 Jan. 1985 13 p
(Contract DE-AC04-76DP-00053)
(DE85-017746; US-Patent-Appl-SN-688671) Avail: NTIS HC A02/MF A01

In a process for preparing a glass or glass-ceramic to metal seal comprising contacting the glass with the metal and heat-treating the glass and metal under conditions whereby the glass to metal seal is effected and, optionally, the glass is converted to a glass-ceramic, an improvement comprises carrying out the heat-treating step using hot isostatic pressing. DOE

N86-15404# Energy Materials Research Co., Berkeley, Calif.
DEVELOPMENT OF RADIATIVE COOLING MATERIALS, PHASE 3 Final Technical Report
[1985] 100 p
(Contract DE-FC03-80SF-11504)
(DE85-014666; DOE/SF-11504/T3-Vol-1) Avail: NTIS HC A05/MF A01

Research on far infrared (FIR, 8-13 micron) transparent polyethylene glazing and FIR selective emitter films for radiative cooling applications was conducted. Materials performance goals were developed from computer modelled cooling calculations of horizontal radiative cooling panels. Emphasis was placed on determining the minimum glazing properties necessary to allow daytime cooling. Minimum solar reflectances for polyethylene glazings were calculated to be between 0.60 to 0.93 depending on other glazing and radiator properties. FIR selective radiators significantly reduced necessary glazing solar reflectance when glazing was also solar absorptive. Glazing films produced were solar transparent, absorptive, or reflective. Approximately 70% solar reflectance was achieved with ZnO pigment while maintaining minimum of 75% FIR transmittance. This glazing would allow cooling if insolation is less than or equal to 800 W/sq cm. ZnS pigmentation produced better solar reflectance but dramatically reduced film FIR transmittance. Neither Ferro Corp's F-6331 black nor fine particle carbon black were found to be good solar absorptive pigments for thin polyethylene films due to high FIR absorption. Poor mechanical properties prohibited development of good selective radiator films for SiO2 and Si3N4 pigmented polyethylene. DOE

N86-15405# Sandia Labs., Albuquerque, N. Mex.
CONFIGURATIONAL DIFFUSION IN SEMIDILUTE SOLUTIONS
J. E. Martin 1985 5 p refs Presented at the Polymer Flow Workshop, La Jolla, Calif., 10 Jul. 1985
(Contract DE-AC04-76DP-00789)
(DE85-017121; SAND-85-1582C; CONF-850778-1) Avail: NTIS HC A02/MF A01

Dynamic light scattering measurements of the relaxation times of internal modes of single polymer chains in semidilute solution are reported for dilute high molecular weight polystyrene in a semidilute poly(vinylemthylether) (PVME)/toluene host. Since PVME is index matched by toluene these light scattering measurements probe the dynamics of the isolated polystyrene chains and are insensitive to the collective fluctuations of the PVME host. The principle result is that the Rayleigh linewidth scales like the third power of the momentum transfer regardless of the concentration of the semidilute polymer. This is in apparent contradiction to current theories of hydrodynamic screening in semidilute solutions, which predict a fourth power dependence for the linewidth. DOE

N86-15406# Sandia Labs., Albuquerque, N. Mex.
EXTENSION OF ELECTRONIC TRANSPORT PROPERTIES OF POLYMER DIELECTRICS TO SEVERE ENVIRONMENTS ENCOUNTERED IN SYSTEMS
S. R. Kurtz Jun. 1984 18 p
(Contract DE-AC04-76DP-00789)
(DE85-017321; SAND-85-1030) Avail: NTIS HC A02/MF A01

The factors that determine the level of radiation-induced conductivity in polymer dielectrics are summarized. These concepts are extended into high-dose radiation environments, beyond the range of our present data. This report provides an introduction of this field to researchers dealing with these effects in systems. DOE

N86-15407# Sandia National Labs., Albuquerque, N. Mex.
THE EFFECT OF ENVIRONMENTAL STRESS ON SYLGARD 170 SILICONE ELASTOMER
W. H. Buckalew and F. J. Wyant May 1985 89 p
(Contract DE-AC04-76DP-00789)
(TI85-013268; NUREG/CR-4147; SAND-85-0209) Avail: NTIS HC A05/MF A01

Dow Corning Sylgard 170 Silicone Elastomer has been investigated to characterize its response to accelerated thermal aging, radiation exposure, and its behavior under applied compressive forces. Sylgard 170 response to accelerated thermal aging suggests the material properties are not particularly age dependent. Radition exposures, however, produce significant, monotonic changes in both elongation and hardness with increasing absorbed radiation dose. Elastomer response to an applied compressive force was strongly dependent on environment temperature and degree of material confinement. Variations in temperature produced large changes in compressive forces applied to confined samples. Attempts to mitigate force fluctuations by means of pressure relief paths resulted in total loss of the applied compressive force. Thus, seal applications employing this elastomer in Class 1E equipment required to function during or following an accident should consider the potential loss of compressive force from long-term aging and potential LOCA temperature transient conditions. Author

N86-15408# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENCE AND TECHNOLOGY
20 Dec. 1985 79 p refs Transl. into ENGLISH from various East European articles
(JPRS-ESA-85-037) Avail: NTIS HC A05/MF A01

Current scientific developments and technical advances from Eastern European nations are reported. Among the topics discussed are: (1) physician recruitment and retention; (2) data bases; (3) pharmacology; (4) enamel; (5) synthetic leather; (6) mining; and (7) engineering products. For individual titles, see N86-15409 through N86-15410.

N86-15409# Joint Publications Research Service, Arlington, Va.
THERMALLY, CHEMICALLY RESISTANT ENAMELS
Maria Zaharescu, Georgeta Jitianu, Eva Barbulescu, and Melania Pascut *In its* East Europe Report: Science and Technology (JPRS-ESA-85-037) 20 Dec. 1985 p 29-37 refs Transl. into ENGLISH from Revista de Chimie (Bucharest, Romania), no. 7, Jul. 1985 p 656-659 (For primary document see N86-15408 06-27)
Avail: NTIS HC A05/MF A01

The physical and chemical criteria underlying the synthesis of thermally and chemically resistant enamels are discussed. An empirical correlation is established between the chemical stability of frits and that of the corresponding enamels. The properties of the enamels were tested both by standard methods and by studying their behavior during the enameling process. A vitreous crystalline enamel with improved technical and product qualities was produced. G.L.C.

N86-15410# Joint Publications Research Service, Arlington, Va.
USE OF NEW POLYURETHANE IN LEATHER SUBSTITUTE
Carmen Anghel and Tudorel Lungu *In its* East Europe Report: Science and Technology (JPRS-ESA-85-037) 20 Dec. 1985 p 67-74 Transl. into ENGLISH from Industria Usoara (Bcharest, Romania), no. 5, May 1985 p 202-211 (For primary document see N86-15408 06-27)
Avail: NTIS HC A05/MF A01

There are two basic trends to be observed worldwide in the area of poromeric and non-poromeric leather substitutes. There is, first of all, the spectacular Japanese development of porometric synthetic leather of the Alcantara type, which possesses characteristics approaching those of natural leather, and then there are the sustained efforts to improve the current generation of synthetic leathers by modifying polymers, textile backings, finishes, technologies, and so forth. B.L.C.

N86-15884# Joint Publications Research Service, Arlington, Va.
FORMATION OF VOLATILE SUBSTANCES DURING POLYMER DESTRUCTION BY PSEUDOMONAS AERUGINOSA
N. D. Novikova and S. N. Zaloguyev *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 109-113 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 74-76 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power*, *20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion.*

N86-15411 Department of the Air Force, Washington, D.C.
SIMULTANEOUS INCREMENTAL STRAIN/INCREMENTAL TEMPERATURE ANALOG DEVICE FOR, AND METHOD, OF TESTING FOR STRESS RESPONSE Patent
K. W. Bills, Jr. and G. J. Svob, inventors (to Air Force) Issued 18 Jun. 1985 9 p
(AD-D011912; US-Patent-4,523,475; US-Patent-Appl-SN-533330; US-Patent-Class-73-781) Avail: US Patent and Trademark Office CSCL 21/9

A device for, and a method of, applying an incremental strain to a test specimen of a solid propellant is described which is at the stress-free temperature, while simultaneously subjecting the test specimen to an incremental temperature change above and below the stress-free temperature. The device includes a frame assembly in which a captive strain multiplier is used to apply the thermally induced loads to the test specimen of the solid propellant that is mounted within the device. Temperature changes, above or below the stress-free temperature, cause volume changes of the rubber members of the strain multiplier and result in the strain multiplier axially loading the mounted test specimen in simulation of the loading conditions that occur in a case-bonded solid rocket grain. When the temperature is raised, the rubber members expand and exert an axial compressive load on the mounted specimen; and, when the temperature is lowered, the rubber members contract and exert an axial tensile load on the mounted specimen.
Author (GRA)

N86-15412*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ANTIMISTING KEROSENE: DEVELOPMENT OF A CONTINUOUS 10 GPM IN-LINE BLENDER Final Report, Aug. 1983 - Sep. 1984
P. Parikh, A. Yavrouian, and V. Sarohia Oct. 1985 29 p refs
(Contracts NAS7-918; DTFA03-80-A-00215)
(NASA-CR-176432; JPL-Pub-D-2582; NAS 1.26:176432; FAA/CT-85/12) Avail: NTIS HC A03/MF A01 CSCL 07D

A continuous inline blender is developed at JPL to blend precisely metered quantities of ICI developed polymer slurries into a stream of Jet-A fuel. The inline blender is used to produce 5 to 10 gallons per minute of freshly blended AMK. The proprietary ICI slurries are made of FM-9 type polymers in a glycol/amine carrier fluid. Depending upon the polymer particle size and powder loading, the slurry consistency ranges from free flowing to a paste with viscosities in the range of 5000 to 100,000 centipoise. With one of the polymer slurries, a provision is made for a time delay between the addition of slurry and the addition of the amine sequentially into the Jet-A stream. Author

N86-15413# Maryland Univ., College Park. Dept. of Mechanical Engineering.
MICROSTRUCTURAL ORIGINS OF HOT SPOTS IN RDX EXPLOSIVE AND SEVERAL REFERENCE INERT MATERIALS Summary Report, 30 Dec. 1981 - 30 Sep. 1984
W. L. Elban, J. C. Hoffsommer, D. J. Glover, C. S. Coffey, and R. W. Armstrong Nov. 1984 46 p
(Contract N00014-82-K-0263; DA P2402)
(AD-A158223; NSWC-MP-84-358) Avail: NTIS HC A03/MF A01 CSCL 19/1

The research effort over the past three years to investigate the microstructural basis for hot spot formation in RDX explosive is summarized. The microstructure and the deformation and fracture behavior of various laboratory-grown and production-grade RDX crystals have been investigated and compared to selected reference inert materials, particularly MgO and MgF2. Microstructural characterization was accomplished using a number of X-ray diffraction techniques, including the Laue method, Berg-Barrett X-ray topography, and powder diffractometry, and by optical and scanning electron microscopy. Several types of controlled deformation experiments have been performed by microindentation hardness testing. The initial stages of chemical decomposition in plastically deformed and fractured RDX have been studied. The fractoemission behavior of RDX crystals fractured in compression and in three-point bending was determined, and the concentrations of two nitroso compounds formed during drop-weight impact testing were measured, Infrared emission was measured during the drop-weight impact deformation of PETN explosive crystals. GRA

N86-15414# Alabama Univ., Huntsville. Dept. of Mechanical Engineering.
MULTI-DIMENSIONAL COMBUSTION INSTABILITY ANALYSIS OF SOLID PROPELLANT ROCKET MOTORS Final Report, 15 Mar. 1983 - 14 Mar. 1985
T. J. Chung 15 May 1985 47 p
(Grant AF-AFOSR-0084-83)
(AD-A158314; AFOSR-85-0567TR) Avail: NTIS

HC A03/MF A01 CSCL 21/8

Analytical models are developed for the multi-dimensional combustion instability analysis of solid propellant rocket motors. This research was motivated by the need for improvement of the current practice in combusiton instability analysis. For example, the burning rates and response functions are affected by the extremely complex flowfield. The flow is three-dimensional or at least two-dimensional in axisymmetric geometries; vortex motions and turbulent flows must be adequately calculated; the coupling mechanism of acoustic and hydrodynamic wave oscillations and particle damping should be clarified. These flowfield phenomena, after all, are originated from the flame zone activities oscillatory behavior of all field variables such as temperature, velocity, pressure, density of the gas, and fuel fractions. The response functions, which serve as boundary conditions for the flowfield can be calculated from the first and second order perturbation eigenvalue analyses of the flame zone governing equations. The effect of velocity coupling appears, naturally, in the second order (nonlinear) solutions. All calculations are carried out using the finite element method. Some of the findings are summarized. GRA

N86-15415# Monsanto Co., Dayton, Ohio.
VARIABILITY OF MAJOR ORGANIC COMPONENTS IN AIRCRAFT FUELS Final Report, Nov. 1983 - Dec. 1984
B. Mason, K. Wiefling, and G. Adams Aug. 1985 216 p
(Contract F08635-83-C-0067)
(AD-A159057; AFESC/ESL-TR-85-13) Avail: NTIS
HC A10/MF A01 CSCL 21/4

This report summarizes qualitative data on the chemical variability of approximately 300 features (chemical components or mixture of components) in neat Air Force distillate fuels, in water equilibrated with the fuels, and in the vapor phase above the fuels, from over 50 fuel sources. These data were obtained to better understand the environmental effects of possible fuel spills and to serve as baseline data which can be used in the development of environmental models for photochemical smog, soot formation from Air Force use of these fuels. Over 50 petroleum-derived JP-4 fuels, one shale-derived JP-4 fuel, and one petroleum-derived JP-5 fuel were analyzed. This report summarizes results for the variability of the major features in water which has been equilibrated with the neat fuels, and in the headspace above the neat fuels. Data base management programs were used to measure feature variability in the data base of over 50 fuels. Feature concentration averages, ranges, standard deviations, and percent relative standard deviations were determined for the 300 features in over 50 fuels, analyzed in duplicate. The variability of data acquisition and data analysis phases of the study was also assessed by calculating the averages, ranges, standard deviations, and percent relative standard deviations for the 300 feature concentrations of one JP-4 fuel which was used as the Reference Fuel and analyzed 18 times for water-soluble features and seven times for vapor phase features. GRA

N86-15416# AeroChem Research Labs., Inc., Princeton, N. J.
FUEL EFFECTS ON SOOT FORMATION IN TURBOJET ENGINES Final Report, 15 Sep. 1983 - 14 Mar. 1985
R. J. Gill and D. B. Olson Aug. 1985 104 p
(Contract N00014-83-C-2311; DA Proj. Z08-38)
(AD-A159073; AEROCHEM-TP-451) Avail: NTIS
HC A06/MF A01 CSCL 21/4

The results of tests on how fuel composition affects the performance of three Navy aircraft engine combustors, the TF30, T56, and T53, were analyzed. The objective of this analysis was to identify which fuel property best correlated with the smoke-related measurements: radiation flux, linear temperature rise, smoke number, and smoke emissions. The effects of fuel composition were investigated by using a series of 10 Naval Air Propulsion Center jet fuels with various properties, such as hydrogen contents of 12.83 to 13.82% and total aromatic hydrocarbon contents of 15.9 to 28.5%. Several laboratory combustion characteristics of these fuels were measured and these characteristics were used in analysis. Altogether, 15 fuel parameters were used to correlate the 45 combustor test results. The reported operating conditions of the tests, such as inlet air pressure, inlet air temperature, or fuel/air ratio, were also used as correlating parameters to determine whether variations in these variables, nearly constant for individual tests, also affected the smoke-related test results. GRA

N86-15417# Department of Energy, Washington, D. C.
EXTRUSION CAST EXPLOSIVE Patent Application
K. J. Scribner, inventor (to DOE) (California Univ., Livermore, Lawrence Livermore Lab.) Filed 29 Jan. 1985 20 p
(Contract W-7405-eng-48)
(DE85-017785; US-Patent-Appl-SN-696276) Avail: NTIS
HC A02/MF A01

Improving, multiphase, high performance, high energy, extrusion cast explosive compositions, comprising, a crystalline explosive material; an energetic liquid plasticizer; a urethane prepolymer, comprising a blend of polyvinyl formal, and polycaprolactone; a polyfunctional isocyanate; and a catalyst are disclosed. These new explosive compositions exhibit higher explosive content, a smooth detonation front, excellent stability over long periods of storage, and lower sensitivity to mechanical stimulants. DOE

N86-15418# Department of Energy, Washington, D. C.
MINIATURE PLASMA ACCELERATING DETONATOR AND METHOD OF DETONATING INSENSITIVE MATERIALS Patent Application
R. W. Bickes, Jr. (Sandia Labs., Albuquerque, N. Mex.), M. R. Kopczewski (Sandia Labs., Albuquerque, N. Mex.), and A. C. Schwarz, inventors (to DOE) (Sandia Labs., Albuquerque, N. Mex.) Filed 4 Jan. 1985 19 p
(Contract DE-AC04-76DP-00789)
(DE85-017747; US-Patent-Appl-SN-688672) Avail: NTIS
HC A02/MF A01

The invention is a detonator for use with high explosives. The detonator comprises a pair of parallel rail electrodes connected to a power supply. By shorting the electrodes at one end, a plasma is generated and accelerated toward the other end to impact against explosives. A projectile can be arranged between the rails to be accelerated by the plasma. An alternative arrangement is to a coaxial electrode construction. The invention also relates to a method of detonating explosives. DOE

N86-15419# Sandia National Labs., Albuquerque, N. Mex.
SPECTROSCOPIC STUDIES OF DETONATING HETEROGENEOUS EXPLOSIVES
A. M. Renlund and W. M. Trott 1985 10 p refs Presented at the Physics of Explosives Technical Meeting, Albuquerque, N. Mex., 17 Oct. 1985
(Contract DE-AC04-76DP-00789)
(DE85-007687; SAND-84-1605C; CONF-851038-1) Avail: NTIS
HC A02/MF A01

The experimental objectives of this work are to use real-time spectroscopic techniques, emission spectroscopy and Raman spectra to monitor chemical and physcial changes in shock-loaded or detonating high explosive (HE) samples. The investigators hope to identify chemical species including any transient intermediates. Also, they wish to determine the physical state of the material when the reactions are taking place; measure the temperature and the pressure; and study the effect of different initiation parameters and bulk properties of the explosive material. This work is just part of the effort undertaken to gain information on the detailed chemistry involved in initiation and detonation. In summary, the investigators have obtained vibrational temperatures of some small radical products of detonation, which may correlate with the detonation temperature. They have also observed that NO2 is an early product from detonating HNS and RDX, and that other electronically excited radical species such as CN(B) are formed in HNS detonations. In the Raman work, the single-pulse spectra could be obtained even in the severe environment of a detonation, and that the rate of removal of the parent molecule could be monitored. DOE

N86-15345# Joint Publications Research Service, Arlington, Va.
EVALUATING STRUCTURAL CHANGES IN JET FUELS BY

ELECTRICAL CONDUCTIVITY AND VISCOSITY
A. I. Belousov and Ye. M. Bushuyeva *In its* USSR Report: Chemistry (JPRS-UCH-85-013) 22 Oct. 1985 p 39-40 Transl. into ENGLISH from Khimiya i Tekhnologiya Topliv i Masel (Moscow, USSR), no. 3, Mar. 1985 p 20-21 (For primary document see N86-15344 06-23)
Avail: NTIS HC A04/MF A01

N86-15346# Joint Publications Research Service, Arlington, Va.
EFFECTS OF VIBRATION-INDUCED CAVITATION OF PHYSICOCHEMICAL CHARACTERISTICS OF AIRCRAFT FUEL
P. P. Mertsalov, B. G. Bedrik, and K. L. Suponko *In its* USSR Report: Chemistry (JPRS-UCH-85-013) 22 Oct. 1985 p 46-47 Transl. into ENGLISH from Khimiya i Tekhnologiya Topliv i Masel (Moscow, USSR), no. 7, Jul. 1985 p 23-25 (For primary document see N86-15344 06-23)
Avail: NTIS HC A04/MF A01

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N86-15420# Hokkaido Univ., Sapporo (Japan). Faculty of Engineering.
BULLETIN OF THE FACULTY OF ENGINEERING, HOKKAIDO UNIVERSITY, NO. 128
Oct. 1985 121 p refs In JAPANESE; ENGLISH summaries (ISSN-0385-602X) Avail: NTIS HC A06/MF A01

The Bulleting of the Faculty of Engineering of Hokkaido (Japan) University (No. 28, Oct. 1985) contains articles on the following topics: the deformation behavior of anisotropic sand during stress axis rotation; a study of reactive sputter etching; the athermal condition of optical elements; catalytic activity of clinoptilolite in methanol conversion; a down-scattering spectrometer using a spallation neutron source; an assignment algorithm using a multilinked data structure; the accuracy of polynomial approximation of the quasi-minimax method; and, an analysis of drops in the accuracy of the least-squares approximation. For individual titles, see N86-15421 through N86-15428.

N86-15421# Hokkaido Univ., Sapporo (Japan).
DEFORMATION BEHAVIOR OF ANISOTROPIC SAND DURING PRINCIPAL STRESS AXES ROTATION **c39**
Kinya Miura, Seiichi Miura, and Shosuke Toki *In its* Bulletin of the Faculty of Engineering, Hokkaido Univ., No. 128 Oct. 1985 39 p refs In JAPANESE; ENGLISH summary (For primary document see N86-15420 06-31)
Avail: NTIS HC A06/MF A01

To investigate the fundamental characteristics of the deformation behavior of sand under general stress conditions involving the rotation of the principal stress axes, a series of drained tests was carried out on dense anisotropic sand using a hollow cylinder torsional shear apparatus. The hollow cylindrical specimens have an anisotropic fabric formed by the parallel alignment of particles induced during the sand deposition in a mold, and are tested under principal stress axes rotation maintaining the values of the three principal stresses constant. Experimental results show that the shear deformation of sand under the rotation of principal stress axes and the effects of the inherent anisotropic fabric on the deformation behavior are considerably large. It is indicated that the anisotropic deformation characteristics can be explained by taking account of the predominant sliding occurring on the bedding plane, irrespective of whether the principal stress axes rotate or not. This consideration seems to be supported by the fact that the bedding plane has the lowest value of the resistance against shear stress, owing to the horizontal alignment of subelongated sand particles. Author

N86-15422# Hokkaido Univ., Sapporo (Japan).
A STUDY OF REACTIVE SPUTTER ETCHING FOR CARBON STEEL BY FREON GAS: ON THE EFFECT OF OXYGEN GAS MIXTURE **c26**
Toshio Yuhta, Jun Osanai, Toshikazu Satoh, and Tatsuo Takahashi *In its* Bulletin of the Faculty of Engineering, Hokkaido Univ., No. 128 Oct. 1985 26 p refs In JAPANESE; ENGLISH summary (For primary document see N86-15420 06-31)
Avail: NTIS HC A06/MF A01

A study of reactive sputter etching of carbon steel using Freon gas is conducted. This tests dry etching as a new method for the processing of micro mechanical parts. Investigated are experiments on the improvement of etching characteristics using oxygen gas mixed with the reactive gas. The results obtained were as follows: improvement of etching characteristics; the decrease of etch rate was not large, but with a low value of the mixture ratio (0.09), the improvement of surface roughness was remarkable. However, the applicable region was limited. When the mixture value exceeded 0.09, the etch rate rapidly decreased and the surface roughness approached that of a pre-machined surface. Author

N86-15423# Hokkaido Univ., Sapporo (Japan).
ATHERMAL CONDITIONS OF OPTICAL ELEMENTS AND PROPERTIES OF OPTICAL MATERIALS **c74**
Teruhito Mishima, Kenji Hisadome, and Ichiro Sakuraba *In its* Bulletin of the Faculty of Engineering, Hokkaido Univ., No. 128 Oct. 1985 74 p refs In JAPANESE; ENGLISH summary (For primary document see N86-15420 06-31)
Avail: NTIS HC A06/MF A01

In precision interferometry, as in interferometry for the determination of the refractive index of gas, the temperature dependence of optical path length of a transparent window is important. The temperature coefficients of optical path length of transparent windows are calculated for various optical materials in vacuum and several gases. The conditions where temperature coefficients are equal to zero are studied using generalized athermal conditions. As the result, it is found that LHG-10 is good for normal incident window in air and for Brewster window in vacuum, and athermal glass 3036 and another athermal glass 3038 are good for normal incident window in vacuum and Brewster window in air, respectively. For these windows the temperature coefficients normalized by the thickness of the window are of the order of 10 to the -7 power C, so that temperature tolerance of the order of 0.1C can be allowed in the interferometric system which has the solution of 10 to the -4 power lambda. In the last stage, the athermal condition independent of incident angle is checked with material constants of optical materials and gases and it is found that the condition is, at this moment, far from that required. Material meeting these conditions should be developed. Author

N86-15424# Hokkaido Univ., Sapporo (Japan).
THE CATALYTIC ACTIVITY AND SELECTIVITY OF CHEMICAL TREATED CLINOPTILOLITE IN THE CONVERSION OF METHANOL **c25**
Harumi Sakou, Masahiro Nitta, and Kazuo Aomura *In its* Bulletin of the Faculty of Engineering, Hokkaido Univ., No. 128 Oct. 1985 25 p refs In JAPANESE; ENGLISH summary (For primary document see N86-15420 06-31)
Avail: NTIS HC A06/MF A01

The catalytic activity and selectivity of clinoptilolites modified with HCl, NH4Cl, H2SO4 and NH4HSO4 are determined by the conversion of methanol to hydrocarbons. The conversion to hydrocarbons increases with the increase in degree of proton exchange. The hydrocarbons produced are essentially only aliphatic compounds with the number of carbon atoms of 6 or below, mainly C2-C5 olefins. The removal of Al by acids from the clinoptilolite framework enlarges the pore size and results in the decrease of the selectivity for C2-C4 olefins; however, the deposition of sulphur from H2SO4 or NH4HSO4 on the surface decreases the pore size and increases the selectivity up to 83 wt% at almost 100% conversion. The surface properties of the modified catalysts are investigated by means of XRD, XPS and heat of immersion. It is found out that the strong Bronsted acid sites formed by hydrogen ion exchange and molecular shape-selectivity due to the pore, of which the size was precisely controlled by the deposition of SO sub 4 sup 2(-) ions, are the dominant factors for

the catalytic activity and the product selectivity in this reaction, respectively. Author

N86-15425# Hokkaido Univ., Sapporo (Japan).
CRYSTAL ANALYSER MIRROR TYPE DOWN-SCATTERING SPECTROMETER USING SPALLATION NEUTRON SOURCE **c35**

K. Inoue, K. Kaji, Y. Kiyanagi, T. Kanaya, H. Iwasa, and K. Nishida *In its* Bulletin of the Faculty of Engineering, Hokkaido Univ., No. 128 Oct. 1985 35 p refs In JAPANESE; ENGLISH summary (For primary document see N86-15420 06-31)
Avail: NTIS HC A06/MF A01

A crystal analyzer having a mirror type down-scattering neutron spectrometer is developed and installed at a spallation pulsed neutron source. By using the pulsed source and the crystal analyzer mirror, the spectrometer has a performance feature with a capability of measuring the density of states over a wide region from several 1/cm to 3000 1/cm. Its usefulness is demonstrated in dynamical structure studies for molecular crystals, molecular liquids, polymers, magnetic substances, and other materials. Author

N86-15426# Hokkaido Univ., Sapporo (Japan).
ON THE ASSIGNMENT ALGORITHM BY MEANS OF MULTI-LINKED DATA STRUCTURE **c61**

Tsutomu Da-Te and Hidetoshi Nonaka *In* the Bulletin of the Faculty of Engineering, Hokkaido Univ., No. 128 Oct. 1985 61 p In JAPANESE; ENGLISH summary (For primary document see N86-15420 06-31)
Avail: NTIS HC A06/MF A01

A problem of assigning individuals to classes under certain rules is presented. An individual can be assigned to one class according to both the priorities attached from an individual to classes and from a class to individuals. Such problems are often encountered, for instance, in the assignment of students to departments or certain goods to storehouses, and so on. In the present algorithm, two-dimensionally multilinked data structure is used. The utility of the algorithm and time complexity are discussed to some extent, notwithstanding the difficulty in making theoretical estimations for time complexity. Several results of computer simulations are given to illustrate the expected time complexity of the algorithm. Author

N86-15427# Hokkaido Univ., Sapporo (Japan).
ACCURACY OF POLYNOMIAL APPROXIMATION OF QUASI-MINIMAX METHODS **c64**

Tsutomu Da-Te and Mayuka Kawaguchi *In its* Bulletin of the Faculty of Engineering, Hokkaido Univ., No. 128 Oct. 1985 64 p refs In JAPANESE; ENGLISH summary (For primary document see N86-15420 06-31)
Avail: NTIS HC A06/MF A01

Methods of finding a polynomial that can be used to determine approximate values of a given function are discussed. The minimax method is considered to give the best approximations for this purpose, but its procedure to obtain polynomials is so complicated that more simple and convenient algorithms with minimal loss of accuracy have been required. Along with the above formula, the sine function and exponential function as representative samples are used, and their accuracies compared with those of the approximations, which are arranged as a sort of quasi-minimax algorithms in such a way as to simplify the minimax method. Author

N86-15428# Hokkaido Univ., Sapporo (Japan).
ANALYSIS OF DROPS IN ACCURACY OF LEAST-SQUARES APPROXIMATION **c64**

Mayuka Hawaguchi and Tsutomu Da-Te *In its* Bulletin of the Faculty of Engineering, Hokkaido Univ., No. 128 Oct. 1985 64 p refs In JAPANESE; ENGLISH summary (For primary document see N86-15420 06-31)
Avail: NTIS HC A06/MF A01

It is demonstrated that, in the practical use of the least square methods, unexpected trouble, is often encountered and that the resulting fitness often fails even if the degree of polynomials is increased. Theoretical considerations are given to this problem introducing the measure of fitness and it is shown that the failure of fitness in a power series approximation arises from an ill-conditioned case of equations to be solved. For Legendre polynomials, however, such failure of fitness is not expected from that view-point. The numerical experiments show the above projection to a high extent. Author

N86-15429# National Bureau of Standards, Washington, D.C. Center for Fire Research.
SUMMARIES OF CENTER FOR FIRE RESEARCH GRANTS AND IN-HOUSE PROGRAMS, 1985

Sonya M. Cherry Nov. 1985 149 p
(NBSIR-85-3258) Avail: NTIS HC A07/MF A01

This conference report was prepared for distribution at the First International Symposium on Fire Safety Science, October 7 to 11, 1985 in Gaithersburg, Md. It contains extended abstracts of grants for fire research sponsored by the Center for Fire Research, National Bureau of Standards, as well as descriptions of the internal programs of the Center for Fire Research. Author

N86-15430# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Structures Lab.
REPAIR, EVALUATION, MAINTENANCE, AND REHABILITATION RESEARCH PROGRAM. THE CONDITION OF CORPS OF ENGINEERS CIVIL WORKS CONCRETE STRUCTURES Final Report

J. E. McDonald and R. L. Campbell, Sr. Apr. 1985 136 p
(AD-A157992; WES/TR/SL-REMR-CS-2) Avail: NTIS HC A07/MF A01 CSCL 13/2

Two computerized data bases were compiled: (1) structure-description, and (2) damage and repair. The structure-description data base contains basic information (location, category, age, purpose, etc.) on 766 projects. The damage and repair data base contains information on the current condition of the concrete in the Corps' civil works structures as determined through detailed reviews of over 2000 periodic inspection reports. To assist in the analysis, a number of computer programs were developed to manipulate and search the data bases. This analysis concentrated on the types of deficiencies observed, the cause (if reported), location within the structure, and degree of damage. In cases where the deficiency had been repaired, the material or technique or both that were used and the performance were analyzed. This identification and assessment of problems relating to evaluation, maintenance, and repair of concrete will provide guidance in developing and establishing priorities for research in the Repair, Evaluation, Maintenance, and Rehabilitation (REMR) Research Program. GRA

N86-15431# Forest Products Lab., Madison, Wis.
CONDENSATION POTENTIAL IN HIGH THERMAL PERFORMANCE WALLS. HOT, HUMID SUMMER CLIMATE Forest Service Research Paper

G. E. Sherwood Jul. 1985 30 p
(AD-A158002; FSRP-FPL-455) Avail: NTIS HC A03/MF A01 CSCL 13/1

To observe actual moisture patterns and the potential for condensation due to long periods of air conditioning in a hot, humid climate, a test structure was constructed near Gulfport, Mississippi, for exposure of eight types of insulated wall panels at controlled indoor conditions and typical outdoor weather conditions. Panels were instrumented with moisture sensors and tested without (Phase 1) and with (Phase 2) penetrations (electrical outlets) in the indoor surface. There was no sustained condensation in any of the walls during either winter season. One type of high thermal performance wall had sustained condensation during both summers, but the wall dried out as the weather became cooler, and moisture content of framing never exceeded 17 percent. Low-permeance sheathing appeared to provide resistance to the buildup of moisture during summer in walls with high overall R values. Penetrating the walls with electrical outlets resulted in slightly higher moisture levels in all of the walls throughout the year. This paper should be useful to building designers, builders, and building code officials in establishing vapor retarder requirements for walls. GRA

N86-15432# New Mexico Univ., Albuquerque. Engineering Research Inst.
MODELING OF CONCRETE, SOIL, AND INTERFACES Final Report, Nov. 1983 - Oct. 1984
H. L. Schreyer Jun. 1985 106 p
(Contract F29601-81-C-0013)
(AD-A158062; NMERI-8-13-TAB-80; AFWL-TR-85-05) Avail: NTIS HC A06/MF A01 CSCL 13/3

The ability to predict the response of structures subjected to large, abrupt bursts of energy depends on a number of factors. These include load definition, the characteristics of the geological material in which the structure is embedded, the mechanism by which forces are transferred from the geological material to the structure, and the characteristics of the structure. The basic objective of the research project discussed here is to provide an improved understanding of the response of common geological and structural materials and of structure-media (concrete-soil) interfaces (SMI), to abrupt loading. For this purpose, engineering constitutive models have been developed, and appropriate experimental data are being used to validate the models. An improved relation for predicting the limit surface of concrete is given. The need for new devices and measurement techniques for rate effects in concrete and the response of unsaturated clay and salt is discussed. Preliminary data from existing experimental equipment are shown. The implications of strain softening are displayed with the use of a model problem. Proposed work includes the use of a strain-softening model to represent interfaces, the extension of the viscoplastic model to represent anisotropic media, and the determination of rate effects in concrete for one and two-dimensional experimental specimens. GRA

N86-15433# Florida Univ., Gainesville.
DESIGN OF FOUNDATIONS IN PERMAFROST M.S. Thesis
K. R. Shankle 1985 80 p
(Contract N66314-72-A-3029)
(AD-A158063; AD-F630692) Avail: NTIS HC A05/MF A01 CSCL 13/2

The relatively recent growth in military and scientific facilities in polar regions and the industrial exploitation of Alaska and northern Canada, has necessitated a better understanding of the physical environment of cold regions. With this increased activity and occupation of cold regions also comes the need for better engineered structures. Foundations on permafrost, or perennially frozen ground, present special problems and demands in design and construction. Design of foundations in areas of seasonal frost where the material below the frost line remains unfrozen present certain problems. However, by taking structural loads to depths below the frost line, potential problems from heave and lateral thrust are generally removed. Permafrost itself is actually a fairly good material with high compressive strength. However, it does tend to creep under load, and cyclical freezing and thawing are of particular concern. Freezing and thawing have dramatic effects on the soil properties upon which the stability or a structure depends. The magnitude of these effects depend not only on the type of soil and its water content, but also on environmental factors such as weather, ground cover, snow, and the thermal properties of subsurface materials. GRA

N86-15434# Ohio State Univ., Columbus.
AN EXPERIMENTAL STUDY OF AN ULTRA-MOBILE VEHICLE FOR OFF-ROAD TRANSPORTATION. APPENDIX 2. DISSERTATION. KINEMATIC OPTIMAL DESIGN OF A SIX-LEGGED WALKING MACHINE Ph.D. Thesis
R. B. McGhee, K. J. Waldron, and S. M. Song May 1985 432 p
(Contract MDA903-82-K-0058)
(AD-A159147) Avail: NTIS HC A19/MF A01 CSCL 13/6

Chapter 2 is a review of previous work in the following two areas: The mechanical structure of walking machines and walking gaits. In Chapter 3, the mathematical and graphical background for gait analysis is presented. The gait selection problem in different types of terrain is also discussed. Detailed studies of the major gaits used in level walking are presented. In Chapter 4, gaits for walking on gradients and methods to improve stability are studied. Also, gaits which may be used in crossing three major obstacle types are studied. In Chapter 5, the design of leg geometries based on four-bar linkages is discussed. Major techniques to optimize leg linkages for optimal walking volume are introduced. In Chapter 6, the design of a different leg geometry, based on a pantograph mechanism, is presented. A theoretical background of the motion characteristics of pantographs is given first. In Chapter 7, some other related items of the leg design are discussed. One of these is the foot-ankle system. A few conceptual passive foot-ankle systems are introduced. The second is a numerical method to find the shortest crank for a four-finitely-separated-position-synthesis problem. The shortest crank usually results in a crank rocker, which is the most desirable linkage type in many applications. Finally, in Chapter 8, the research work presented in this dissertation is evaluated and the future development of walking machines is discussed. GRA

N86-15435# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
19 Sep. 1985 75 p Transl. into ENGLISH from various West European articles
(JPRS-WST-85-028) Avail: NTIS HC A04/MF A01

Progress in West European Science and technology is reported. Topics discussed include: advanced materials, biotechnology, civil aviation, factory automation, microelectronics, scientific and industrial policy, and technology transfer. For individual titles, see N86-15436 through N86-15437.

N86-15436# Joint Publications Research Service, Arlington, Va.
FRG TURNS EFFORTS TO LASER DEVELOPMENT **c36**
Klaus Gertoberens *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-028) 19 Sep. 1985 p 27-28 Transl. into ENGLISH from Sueddeutsche Zeitung (Munich), 17 Jul. 1985 p 25 (For primary document see N86-15435 06-31)
Avail: NTIS HC A04/MF A01

Recommendations, and development of laser applications is discussed. In terms of its technical and economic significance this key technology is compared with microelectronics. Lasers are light sources which emit highly focused, intense rays with virtually infinite potential applications. Lasers (Light Amplification by Stimulated Emission of Radiation) are used especially in measurement technology and medical technology and in optical communications engineering. As wearfree universal machines tools, they assume great significance in production. The light has also become a weapon called Star Wars. E.A.K.

N86-15437# Joint Publications Research Service, Arlington, Va.
FUJI, THOMSON TO DEVELOP, PRODUCE HIGH-POWERED TRANSISTORS **c33**
P. DeVittor *In its* West Europe Report: Science and Technology p 53-57 Transl. into ENGLISH from Elettronica Oggi (Milan), May 1985 p 117-122 (For primary document see N86-15435 06-31)
Avail: NTIS HC A04/MF A01

Some development lines pursued in making innovative products in the field of transistors for power switching are pointed out. The essential features of the new high-power modules produced are outlined. E.A.K.

N86-15438# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
5 Nov. 1985 119 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-038) Avail: NTIS HC A06/MF A01

Progress in science and technology in the People's Republic of China is reported. Topics include: national developments, physical sciences, applied sciences, acoustics, chemistry, electronics, high energy physics, mathematics, physics, and semiconductors. For individual titles, see N86-15439 through N86-15442.

N86-15439# Joint Publications Research Service, Arlington, Va.
HYDROGEN DIFFUSION, POSITRON ANNIHILATION IN 40CrNiMo STEEL **c26**
Du Fengmu, Gui Jianian, and Wang Zixiao *In its* China Report:

Science and Technology (JPRS-CST-85-038) 5 Nov. 1985 p 34-36 refs Transl. into ENGLISH from Wuhan Dzxue Xuebao (Ziran Kexue Ban) (Wuhan), no. 2, 1984 p 95-96 (For primary document see N86-15438 06-31)
Avail: NTIS HC A06/MF A01

The 40CrNiMo steel which has superior overall mechanical and technological properties and is used in aeronautical applications is discussed. Various quenching and tempering treatments can be used to meet different strength and tenacity requirements. The diffusion behavior of hydrogen in this material and its ability to resist hydrogen losses was studied. The electrochemical permeation method is used to determine the effect of tempering temperature on the diffusion coefficient and surface solubility of hydrogen, which were compared with the Doppler broadening line pattern parameter-S in positron annihilation parameter. The hydrogen diffusion behavior is confirmed. E.A.K.

N86-15440# Joint Publications Research Service, Arlington, Va.
CHINA REACHES NEW LEVEL IN MINICOMPUTER DEVELOPMENT **c36**
In its China Report: Science and Technology (JPRS-CST-85-038) 5 Nov. 1985 p 39-46 refs Transl. into ENGLISH from Jisuanji Shijie (Beijing), no. 15, 8 Aug. 1985 p 1 (For primary document see N86-15438 06-31)
Avail: NTIS HC A06/MF A01

Stability of electron trajectories in free-electron lasers with an axial magnetic field is analyzed. The results show that in the case of noncyclotron-resonance (omega sub 0 is not equal to kappa sub 0 Vsub2) (V=initial velocity) the trajectories are unstable if the condition omega sub 0 - kappa sub 0 V sub 2) (2 omega sub omega)sq. = 1 is satisfied, while in the case of cyclotron-resonance (omega sub c = kappa sub 0 V sub beta) the trajectories are always stable if the initial perpendicular velocities of electrons are small. Oscillation amplitudes of the parallel velocities of electrons depend on the ratio beta sub omega/beta sub 0. The smaller the ratio, the smaller the oscillation amplitudes. E.A.K.

N86-15441# Joint Publications Research Service, Arlington, Va.
MICRO-POWER DISSIPATION DEVICE DESCRIBED **c33**
Mao Xingwu, Zhou Likai, and Zhou Jianjun *In its* China Report: Science and Technology (JPRS-CST-85-038) 5 Nov. 1985 p 51-56 Transl. into ENGLISH from Dianzi Rexue Jishu (Beijing), v. 15, no. 3, 10 Mar. 1985 p 24-26 (For primary document see N86-15438 06-31)
Avail: NTIS HC A06/MF A01

The common-emitter current gain beta of a common two-pole transistor is generally below 250. They are referred to as high-beta or high gain transistors when the beta of such transistors exceeds 300. When the beta of a transistor is higher than 1,000, it is called a super-beta transistor (SBT) or supergain transistor. The micropower dissipation type has the widest applications among the high-beta. Micropower dissipation high-beta means that there is a high gain or a superhigh gain under a microcurrent. The device is widely used in small signal-detection systems and stereo audio equipment because of their characteristics of high gain, low frequency and low noise under small signals. E.A.K.

N86-15442# Joint Publications Research Service, Arlington, Va.
SELF-QUENCHING STREAMER DISCHARGE CHARACTERISTICS AT EXTREME GAS COMPOSITIONS **c75**
You Tiejian, Yang Baozhong, and Chen Hongfang *In its* China Report: Science and Technology (JPRS-CST-85-038) 5 Nov. 1985 p 64-67 refs Transl. into ENGLISH from Zhongguo Kexue Jishu Daxue Xuebao (Hefei), v. 14, no. 2, Jun. 1984 p 295-297 (For primary document see N86-15438 06-31)
Avail: NTIS HC A06/MF A01

A self-quenching streamer discharge which is produced in filament chambers containing certain gas compositions, and its discharge mechanism were investigated. Self-quenching streamer discharges have large output signals, a narrow amplitude distribution, and a fast rise time. This discharge mode was measured. New phenomena in self-quenching streamer discharges at extreme gas composition, differing from those reported is also observed. E.A.K.

N86-15443# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
14 May 1985 75 p Transl. into ENGLISH from various West European articles
(JPRS-WST-85-015) Avail: NTIS HC A04/MF A01

Several topics related to Western Europe's technology and science effects are discussed. Spacecraft control, the use of antibodies in agriculture, civil aviation, industrial policies, and microelectronics are among the topics covered. For individual titles, see N86-15444 through N86-15446.

N86-15444# Joint Publications Research Service, Arlington, Va.
CNES OF FRANCE RESEARCHES REMOTE CONTROL SYSTEM FOR SPACE **c54**
Jean-Michel Guilbert *In its* West Europe Report: Science and Technology (JPRS-WST-85-015) 14 May 1985 p 1-4 Transl. into ENGLISH from Revue Generale de L'Electricite (Paris), Nov. 9814 p 724; 728-729 (For primary document see N86-15443 06-31)
Avail: NTIS HC A04/MF A01

Mission analysis studies show that the needs for remote control fall into two broad categories: (1) needs for intervention, repair and maintenance; and (2) needs for deployment, assembly and construction. Depending on the missions and on whether the operator is on board the remote-controlling craft or on Earth, the remote-control system will have more or less autonomy of decision. The field of remote-control in space is discussed, as are a few projected or completed systems illustrating the interest of remote control, with or without a man on board. Author

N86-15445# Joint Publications Research Service, Arlington, Va.
SPEED OF HERMES TO GIVE EUROPEANS SPACE ACCESS, DUCROCQ SAYS **c15**
Albert Ducrocq *In its* West Europe Report: Science and Technology (JPRS-WST-85-015) 14 May 1985 p 7-11 Transl. into ENGLISH from Sciences and Avenir (Paris), Feb. 1985 p 82; 84-86 (For primary document see N86-15443 06-31)
Avail: NTIS HC A04/MF A01

After the commercial success of Ariane, the French aerospace industry actually has a new goal: manned flights. In 10 years, the Ariane 5 launcher should be putting the European spacecraft Hermes into orbit. A brief account is given of French participation in U.S. space shuttle flights. Author

N86-15446# Joint Publications Research Service, Arlington, Va.
DFVLR DEVELOPS NEW KIND OF WALLS OR WIND TUNNEL **c09**
In its West Europe Report: Science and Technology (JPRS-WST-85-015) 14 May 1985 p 18-19 Transl. into ENGLISH from Frankfurter Zeitung/Blick Durch die Wirtschaft (Frankfurt/Main), 4 Mar. 1985 p 7 (For primary document see N86-15443 06-31)
Avail: NTIS HC A04/MF A01

A three-dimensional adaptive wind tunnel test section was developed whose walls adapt to the air flow during the test. Initial calculations showed that a thick-walled, flexible rubber tube was found to be the most adaptive kind of material to air flow. The rubber tube is 240 cm long, has a diameter of 80 cm and a wall thickness of 6 cm. A total of 64 spindles-each controlled by a positioning motor-make it possible to reduce the cylindrical test section or also, if required to increase the test cross-section by a maximum of 40 mm. This adaptive test section, also called thicking walls, in addition has 128 pressure holes connected to tiny sensors which permit precise determination of existing pressure directly on the test section wall. Without this exact information no conclusions about interference factors on the model could be made. The first sample measurements were made in the high-speed wind. Measurements were made on various so-called calibration models. The results achieved exceeded all expectations. They have proven identical to the test values which were previously arrived at by computer calculation. R.J.F.

N86-15447# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
13 Aug. 1985 68 p Transl. into ENGLISH from various West European articles
(JPRS-WST-85-024) Avail: NTIS HC A04/MF A01

Several topics related to Western Europe's technology and science efforts are discussed. The Airbus, the use of laser Doppler velocimeters for wind tunnel measurements, prop-fan technology, biotechnology, and microelectronics are among the topics covered. For individual titles, see N86-15448 through N86-15451.

N86-15448# Joint Publications Research Service, Arlington, Va.
LAUNCHERS, SATELLITES, MULTINATIONAL PLANS IN 1985 CHES BUDGET **c81**
In its West Europe Report: Science and Technology (JPRS-WST-85-024) 13 Aug. 1985 p 1-10 Transl. into ENGLISH from AFP Sciences (Paris), 28 Mar. 1985 p 24-32 (For primary document see N86-15447 06-31)
Avail: NTIS HC A04/MF A01

A breakdown of appropriations for the National Center for Space Studies (France) is given. Appropriations are listed for the European Space Agency, several artificial satellites, the Ariane launch vehicle, the Ulysses and Giotto missions, and solar and plasma physics studies. R.J.F.

N86-15449# Joint Publications Research Service, Arlington, Va.
MBB STUDIES VARIABLE-CAMBER WING FOR AIRBUS **c05**
In its West Europe Report: Science and Technology (JPRS-WST-85-024) 13 Aug. 1985 p 20-21 Transl. into ENGLISH from MBB Aktuell (West Germany), Feb. 1985 p 3 (For primary document see N86-15447 06-31)
Avail: NTIS HC A04/MF A01

A program is described that encompasses the application of variable camber to a transonic wing in long-distance aircraft such as the Airbus. The task is to configure previously employed flaps for variable camber use over the entire wing span. R.J.F.

N86-15450# Joint Publications Research Service, Arlington, Va.
FRENCH PROGRAM CHARME DEVELOPS PROPFAN AIRCRAFT **c05**
In its West Europe Report: Science and Technology (JPRS-WST-85-024) 13 Aug. 1985 p 22-24 Transl. into ENGLISH from AFP Sciences (Paris), 14 Mar. 1985 p 25-27 (For primary document see N86-15447 06-31)
Avail: NTIS HC A04/MF A01

France has decided to begin studies on future engines for heavy cargo propeller planes. The first research in France started around 1978, three years after the American Hamilton Standard (of the United Technologies group, which also owns Pratt and Whitney). The French studies are currently carried out as part of the Propeller Design for Fast Plane for Greater Economy (CHARME) program. The French government prefers the term fast plane propeller instead of the American names Propfan, Freefan, or Unducted Fan (UDF) of General Electric. A test of a new propeller, perfected in France and consisting of 12 blades, is scheduled for September 1985 in a wind tunnel which will model flight conditions. This test is intended to determine the noise level of this propeller. R.J.F.

N86-15451# Joint Publications Research Service, Arlington, Va.
FRG USES LASER FOR NON-DESTRUCTIVE TESTING IN WIND CANAL **c38**
In its West Europe Report: Science and Technology (JPRS-WST-85-024) 13 Aug. 1985 p 25-26 Transl. into ENGLISH from VDI Nachrichten (Dusseldorf), 5 Apr. 1985 p 16 (For primary document see N86-15447 06-31)
Avail: NTIS HC A04/MF A01

Over a period of years, laser technology has been adopted in many areas; lately it has gained a place in wind tunnel measurements. After previous applications mainly with laboratory-scale systems, a large measurement system was successfully tested recently in the Goettingen wind tunnel of the German Research and Test Establishment for Aeronautics and Astronautics (DFVLR). The three-component laser doppler anemometer (3-D LDA) will in the future provide aerodynamicists with noncontact and noninterference measurements of stream velocity, for example in testing model airplanes. In contrast to laboratory installations, the large dimensions in the Goettingen wind tunnel require a stand-off of more than two meters from the test article. Since the available laser-light power attenuates very strongly with distance, precision fabrication and assembly of the optical system is required. On their way to the model, the laser beams encounter tiny particles (aerosols) which are transported by the air stream in the wind tunnel. A result is light scattering which, due to the doppler effect, contains the information about the local stream velocity. With the aid of transducer systems the intercepted scattered light is immediately converted into electrical information and stored in computers. R.J.F.

N86-15452# Joint Publications Research Service, Arlington, Va.
USSR REPORT: ELECTRONICS AND ELECTRICAL ENGINEERING Abstracts Only
4 Sep. 1985 116 p Transl. into ENGLISH from various Russian articles
(JPRS-UEE-85-009) Avail: NTIS HC A06/MF A01

Progress in U.S.S.R. electronics and electrical engineering is reported. Specific topics discussed include communications; broadcasting and consumer electronics; antennas and propagation; circuits and systems; solid state circuits; microwave theory and techniques; power engineering; transportation; electromagnetic compatibility; components, hybrids and manufacturing technology; industrial applications; reliability; electron devices; magnetics; quantum electronics, electro-optics; and industrial electronics. For individual titles, see N86-15453 through N86-15472.

N86-15453# Joint Publications Research Service, Arlington, Va.
MILLIMETRIC-WAVE ANTENNAS AND DEVICES: REVIEW Abstract Only **c32**
D. I. Voskresenskiy, V. M. Maksimov, S. V. Rud, and I. G. Sukharev *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 35 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radioelektronika (Kiev, USSR), v. 28, no. 2, Feb. 1985 p 4-23 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

Millimetric waves are eminently suitable for many applications in the national defense and in the national economy, ranging from detection of low-flying objects to meteorological, geological, and medical research. They occupy a unique position in the electromagnetic spectrum, namely between optical waves and radio waves. Most important and interesting among millimetric-wave devices are waveguides, antennas, and antenna auxiliaries. Waveguides are essentially the same as those used for other wave bands, however here there is a choice available between optical or radio-technical methods of energy channeling. Waveguides or transmission lines which have been and are being developed include rectangular and circular single-mode and multimode metal ones, helical ones, metal-dielectric ones, solid and hollow cylindrical dielectric ones, Y-dielectric ones, microstrip lines, dielectric image lines, dielectric strip in substrate, dielectric strip on substrate, grooved open ones and slotted closed ones. Millimetric-wave antennas, on the other hand, require special manufacturing precision on account of critical lossiness and narrow transparence windows in the Earth's atmosphere. B.W.

N86-15454# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF LOG-PERIODIC ANTENNAS WITH PRESCRIBED GEOMETRY Abstract Only **c32**
V. A. Yatskevich *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 37 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radioelektronika (Kiev, USSR), v. 28, no. 2, Feb. 1985 p 40-45 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

The synthesis of log-periodic dipole antennas for wideband shortwave or ultrashort-wave communication systems is shown,

assuming a prescribed array geometry with the oscillator connected to the smallest dipole and with currents in or voltages across the dipoles predetermined for best approximation of the prescribed radiation pattern. The problem of synthesis reduces to calculation of the y-parameters of the connecting four-pole networks which will yield the prescribed amplitude-phase distribution. The procedure begins with synthesis of purely reactive and thus lossless four-pole networks for a fixed single frequency, preferably for the lower limit of the frequency range so that the frequency characteristics of those y-parameters can then be calculated directly without need for additional data, while the input impedance of the antenna is made purely resistive. A reactive feed system is synthesized next according to conventional methodology, which has been simplified for a series rather than parallel feed system. Minimum-phase four-pole networks are considered for physical realization of mathematically established frequency characteristics with reactive circuit elements. B.W.

N86-15455# Joint Publications Research Service, Arlington, Va.
BOUNDARY WAVES IN FINITE ANTENNA ARRAYS Abstract Only **c32**
V. S. Filippov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 39-40 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radioelektronika (Kiev, USSR), v. 28, no. 2, Feb. 1985 p 61-67 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

Boundary effects in a finite antenna array are analyzed by the superposition method, a method less unwieldy and more consistent with the physical nature of the subject than direct numerical methods of solving boundary-value problems of electrodynamics and methods based on an infinite-array model with high concentration of elements in the central region. According to this method the currents in the radiator elements of a finite array are represented as superpositions of quiescent currents in a periodic infinite array, of which the given finite array is a part, and a boundary wave propagating from the edge of that finite array inward. Following a qualitative analysis, the resulting system of equations of a boundary wave is found to be solvable by direct numerical methods for simpler antenna array configurations but only by a special iteration method for more intricate configurations. The iteration procedure, with use of Fourier transformation and asymptotic estimates, is based on complementing the given finite array to a infinite one with radiators under matched loads and then subtracting from the resulting boundary wave the contribution of this complementary array. B.W.

N86-15456# Joint Publications Research Service, Arlington, Va.
SCATTERING BY CYLINDER WITH ANISOTROPIC IMPEDANCE Abstract Only **c32**
A. V. Klimov, B. M. Petrov, and A. I. Semenikhin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 40 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radioelektronika (Kiev, USSR), v. 28, no. 2, Feb. 1985 p 74-78 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

Scattering of plane waves by an isotropic cylinder with anisotropic coating is considered, for the design of radar reflectors and shaping of secondary fields. The corresponding boundary-value problem for the distribution of surface impedance is formulated in accordance with physical optics and reduced to a system of two equations with six unknowns, which leaves four degrees of freedom for combinations of resistances and reactances. Special cases are zero reactances only and zero resistances only, a more general case being rotation of the principal axis of the impedance tensor so that neither reactances nor resistances are zero. The problem is solved rigorously by the separation of variables method, for a cylinder of arbitrary cross-section inside a circumscribing circular cylinder with the smallest possible radius and with the Lorenz lemma in integral for applicable to the region between both cylindrical surfaces. Infinitesimally thin electric and magnetic current filaments as sources of the auxiliary field are placed first inside the inner cylinder and then outside the outer one. B.W.

N86-15457# Joint Publications Research Service, Arlington, Va.
MATRIX ANALYSIS OF PERIODIC INTERLEAVED MULTIFREQUENCY ANTENNA ARRAYS Abstract Only **c32**
L. I. Ponomarev *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 41 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radioelektronika (Kiev, USSR), v. 28, no. 2, Feb. 1985 p 79-86 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

The scattering matrix is constructed for periodic interleaved multifrequency antenna arrays with radiators of q different types within the overall antenna aperture, all radiators of each type excited at the same frequency f sub q. A plane doubly periodic antenna array is considered and on the basis of its finite-dimensional scattering matrix are derived expressions for total gain and surface utilization factor. Calculations by conventional methods of electrodynamics are made for an antenna arrays which operates in the transmitting mode or in the receiving mode, with power rereflection in the latter case, with the radiation field at each frequency represented as a finite Floquet spectrum containing TE-mode and TM-mode plane harmonics. The results of this analysis are used for optimizing the excitation pattern so as to suppress additional side lobes in the antenna radiation pattern at high frequencies, while only plane interference side lobes appear at low frequencies and these can be suppressed by reducing the mismatch between radiators. Author

N86-15458# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF MULTIMODE WAVEGUIDE-TYPE POWER DISTRIBUTOR Abstract Only **c32**
Yu. V. Likhoded and L. I. Ponomarev *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 41-42 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radioelektronika (Kiev, USSR), v. 28, no. 2, Feb. 1985 p 87-91 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

Characteristics of a power distributor which consists of a multimode waveguide excited by several waveguides on the input side and loaded by an array of receiver waveguides on the output side is analyzed, for extending the application of such devices from centimetric-wave power to millimetric-wave power. The corresponding boundary-value problem of electrodynamics is solved numerically in two stages, evaluation of the scattering matrix for the multipole network representing the function of an array of waveguides with smaller cross-section and a waveguide with larger cross-section followed by evaluation of the scattering matrix for a finite array of such multipole networks representing the complete power distributor. In the first stage the smaller waveguides are assumed to be filled with dielectrics having generally a different permittivity each and to contain matching dielectric slugs of appropriate thickness and permittivity each. The transverse electric and magnetic field components are expanded into series of vector eigenfunctions separately for the two characteristic regions, the orthogonal basis vector eigenfunction having the same form for both regions and being calculated with the aid of the scalar potential. Author

N86-15459# Joint Publications Research Service, Arlington, Va.
EXCITATION OF ARRAY OF PLANE-PARALLEL WAVEGUIDES COVERED WITH DIELECTRIC LAYER OF FINITE LENGTH Abstract Only **c32**
B. D. Manuilov and V. M. Shablovskiy *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 43 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radioelektronika (Kiev, USSR), v. 28, no. 2, Feb. 1985 p 96-99 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

An antenna array of plane-parallel waveguides under a dielectric

layer of finite length is considered and excitation of such an array with T-mode waves is analyzed, assuming metallized lower and lateral surfaces except the aperture and an infinitely large ideally conducting flange around the dielectric layer on the upper surface. The corresponding boundary-value problem is solved by the method of partial regions, with superposition of waves inside the waveguides and on the basis of the Lorenz lemma for the dielectric layer as well as for the remaining half-space. The resulting system of integral equations is solved by the Galerkin method. A typical numerical experiment has yielded quite accurately both the efficiency and the directive gain, with the number of terms equal to the number of wave propagating through a plane waveguide with dielectric filler. It also reveals the dependence of the beam orientation error near antiresonance on the beam deflection angle, attributable to prevailing electrodynamic effects. Author

N86-15460# Joint Publications Research Service, Arlington, Va.
USE OF ACTIVE QUENCHING FOR REDUCTION OF POWER DISSIPATION IN DIPOLE ANTENNA ARRAY Abstract Only **c32**

L. I. Ponomarev, A. V. Dolgin, and A. V. Shatalov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 43 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy:: Radioelektronika (Kiev, USSR), v. 28, no. 2, Feb. 1985 p 99-100 (For primary document see N86-15452 06-31)

Avail: NTIS HC A06/MF A01

Reduction of power dissipation in dipoles upon incidence of plane waves by means of an oscillator coherent with the field of such a wave is extended from a single thin dipole to a finite periodic array of thin dipoles with an arbitrary direction of incident waves. The problem reduces to a system of Gallen integral equations for unknown currents and the solution is sought which minimizes the current norm. Calculations for an array with a period d = 1.8 lambda (lambda - wavelength) in both H-plane and E-plane, composed of 0.007 thick and 0.625 lambda long dipoles reveal that the quenching effectiveness factor depends only slightly on the angle of wave incidence. Varying the dipole dimensions reveals that it decreases fast with increasing dipole thickness and peaks to a maximum at some dipole length corresponding to resonance. Author

N86-15461# Joint Publications Research Service, Arlington, Va.
SIGNAL AND INTERFERENCE LEVELS IN ANTENNA ARRAY WITH OPTIMUM RADIATION PATTERN Abstract Only **c32**

A. S. Popov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 44 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radioelektronika (Kiev, USSR), v. 28, no. 2, Feb. 1985 p 103-104 (For primary document see N86-15452 06-31)

Avail: NTIS HC A06/MF A01

An antenna array is considered which has an optimum radiation pattern, with the minimum mean-square deviation of the vector of weight factors as the the optimality criterion and this vector described by the Wiener-Hopf matrix equation. Power of the useful signal and total power of all interference signals in such an array are calculated on this basis, assuming mutually noncorrelated signal, interference, and thermal noise. The results reveal that signal power and interference power as well as combined output power all depended on the signal-to-(interference-noise) ratio at the output. They also indicate the attainable power characteristics of such an antenna array. Author

N86-15462# Joint Publications Research Service, Arlington, Va.
EFFECT OF CORNER REFLECTOR ON FIELD OF LINEAR RADIATOR Abstract Only **c32**

Yu. V. Pimenov and A. K. Salakh *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 44 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 2, Feb. 1985 p 83-84 (For primary document see N86-15452 06-31)

Avail: NTIS HC A06/MF A01

The effect of a corner reflector in the vicinity of an electric dipole on the radiation pattern of the latter is treated as a two-dimensional problem and solved using two systems of coordinates, a Cartesian one and a cylindrical one with common origin 0 and z-axis. The infintely large surface method reduces the problem for the reflector cross-section and contour to an integral equation for the current density distribution induced in the reflector. This equation is in turn solved in two successive approximations, the first one corresponding to symmetric excitation. The resulting expressions for the electromagnetic field in the second approximation apply to any point in space, but they simplify for the far-field region. Author

N86-15463# Joint Publications Research Service, Arlington, Va.
LONGITUDINALLY SLOTTED CYLINDRICAL SHIELD WITH FINITE THICKNESS AND ELECTRICAL CONDUCTANCE Abstract Only **c32**

R. M. Dzhala *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 45 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 30, no. 1, Jan. 1985 p 1-7 Previously announced in IAA as A85-23551 (For primary document see N86-15452 06-31)

Avail: NTIS HC A06/MF A01

The problem of determining E-waves in the presence of a metallic cylinder with a longitudinal sectorial slot in a wall of finite thickness is examined with allowance for the high conductivity of the structure. This problem is reduced to a set of linear algebraic equations with respect to the unknown amplitudes of the diffraction harmonics. Both thin and thick screens are considered, and the effective broadening of the slot is determined. The narrow-slot approximation is used to obtain explicit expressions for resonant-frequency shifts caused by field penetration into the screen and slot. Fluctuations of the frequency dependence of the level of the field passing through a slightly transparent open screen are observed. B.J. (IAA)

N86-15464# Joint Publications Research Service, Arlington, Va.
RADIATION PATTERN AND REDUCED GAIN OF LINEAR ANTENNA IN TURBULENT ANISOTROPIC ATMOSPHERE Abstract Only **c32**

N. A. Armand, I. N. Kibardina, and A. N. Lomakin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 45 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 30, no. 1, Jan. 1985 p 8-14 Previously announced in IAA as A85-23552 (For primary document see N86-15452 06-31)

Avail: NTIS HC A06/MF A01

The radiation pattern and the directive gain of linear antennas in an anisotropic randomly inhomogeneous atmosphere are analyzed for systems with and without compensation of arrival-angle fluctuations. The analysis is based on an anisotropic model for the spectrum of refractive-index fluctuations of the atmosphere. It is shown that, as compared with the anisotropic model, the isotropic model yields higher values of the directive gain and smaller distortions of the radiation pattern, especially at small angles of elevation. This is because the broadening of the pattern and the reduction of directive gain are determined by the magnitude of phase fluctuations of the signal on the aperture, the isotropic model yielding lower values of phase fluctuations at small angles of elevation. B.J. (IAA)

N86-15465# Joint Publications Research Service, Arlington, Va.
MULTILAYER VOLUME MICROWAVE FILTERS Abstract Only **c32**

V. I. Gvozdev, S. V. Smirnov, and A. M. Chernushenko *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 59 Transl. into ENGLISH from Elektrosvyaz (Moscow, USSR), no. 2, Feb. 1985 p 47-48 (For primary document see N86-15452 06-31)

Avail: NTIS HC A06/MF A01

Multilayer volume microwave filters are particularly suitable for miniaturization of radioelectronic devices by way of circuit integration, the principal advantage over planar filters being the much higher Q-factor; Q sub 0 > or = 10 to the 3rd power as compared with Q sub 0 < or = 10 to the 2nd power. Their metal-dielectric

structure forms an array of coupled half-wavelength resonators electrically symmetric with respect to the center layer, coupling being effected by a magnetic field normal to the plane of resonators. The structure consists of an asymmetric strip line with conductor at the input end, followed by a metal layer with cut out symmetric slot line, a dielectric layer, a symmetric strip line with conductor, a metal layer with cut out symmetric slot line, a dielectric layer, and an asymmetric strip line with conductor at the output end. The size of such a filter depends directly on the number of resonator stages and, without the case, is comparable with the size of conventional filters on symmetric strip lines only but is much smaller than that of conventional filters on asymmetric strip lines only.
Author

N86-15466# Joint Publications Research Service, Arlington, Va.
PLASMA PARAMETERS AT LOW LEVEL OF INTRINSIC MICROWAVE RADIATION Abstract Only **c75**
V. N. Kolesnikov and Yu. G. Tishchenko *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 61 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 30, no. 1, Jan. 1985 p 102-105 Previously announced in IAA as A85-23561 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

A method for determining plasma parameters according to intrinsic microwave mission is described which uses the linear transformation of plasma oscillations by inhomogeneities produced by means of finely dispersed particles. The possibility of determining the parameters of a plasma whose level of microwave-emission power is 4-8 times less than that of the surrounding medium is demonstrated experimentally by the introduction of finely dispersed Al2O3 particles into a gas-discharge plasma. B.J. (IAA)

N86-15467# Joint Publications Research Service, Arlington, Va.
ACTIVE MICROWAVE FILTERS Abstract Only **c33**
B. Yu. Kapilevich *In its* USSR Report: Electronics and Electrical Engineering (JPPS-UEE-85-009) 4 Sep. 1985 p 62 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 1, Jan. 1985 p 3-10 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

Design principles and state-of-the-art of microwave filters employing FET, avalanche transit time diodes, Gunn Diodes, varactors, or other microwave semiconductors as active elements with negative dynamic impedance were reviewed and various design approaches were examined. Three main directions in the active filter development, which include the technology, the design and modeling were outlined. It was pointed out that the technological aspects of the active filter development are now focused on finding ways of using active structures or active media for amplification or signal generation. A heterostructure of GaAs substrate with epitaxial active semiconductor n-layer and ohmic contact of AgGaIn alloy on one side of the substrate and dielectric-SiO-metal-Cr-Cu-Ni on the other side can serve as an example of such a structure. It can be used for Q-switched resonators in the two cm range. Prospects of developing monolith microwave filters with GaAs substrates are very attractive. B.W.

N86-15468# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF TRANSIENTS IN DIRECT CURRENT CABLE INSULATION Abstract Only **c33**
M. Yu. Shuvalov, S. Ye. Gleyzer, and E. T. Larina *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 79 Transl. into ENGLISH from Elektrichestvo (Moscow, USSR), no. 3, Mar. 1985 p 49-52 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

This paper thoroughly analyzes the physical phenomena originating in the impregnated oil-paper insulation of a dc cable with the changes applied to it by voltage. A mathematical model of transients is proposed which uses an operational calculus method. The concept of complete operational resistance of insulation is introduced. Formulas are presented which make it possible to determine the distribution of the electrical field in the insulation at any moment of time. As an application of the theoretical results obtained, problems of testing dc currents are considered. It is concluded that if in a steady-state region the electrical field intensity in the dc cable insulation is distributed according to resistance, then in the transient process the image of the intensity is distributed according to the operational resistance.
Author

N86-15469# Joint Publications Research Service, Arlington, Va.
LASER TECHNOLOGY IN MANUFACTURE OF PRINTED-CIRCUIT BOARDS Abstract Only **c36**
G. A. Machulka, M. F. Stelmakh, and A. B. Uladinov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 84 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 2, Feb. 1985 p 3-11 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

The complexity of the printed-circuit board manufacturing process, additionally encumbered by the intricacy of topology and layout, especially in multilayer boards, makes application of laser technology a very attractive possibility. Extensive studies have established the feasibility of using laser radiation in polygraphic dry offset printing, despite difficulties created by the high thermal conductivity of metallized surfaces, also in etching of patterns, drilling of holes, and soldering of joints. A gaseous (CO2) laser and a solid-state (garnet) laser have been found to be most suitable, each for specific operations. One of the most critical factors here is selection of oxidation-resistant materials for masks and insulation. The next step is incorporating the laser operations in the production line. The feasibility of this has been established in three versions. The first and simplest version, without computer, is proposed for experimental or pilot production of bilateral boards. The second version is proposed or commercial production, with an automatic work station and a control computer. In the third and most advanced version, for large-scale production, the automatic work station has been replaced by a computer-aided design system. B.W.

N86-15470# Joint Publications Research Service, Arlington, Va.
PROCEDURE FOR CALCULATING ATTENUATION IN AND RELIABILITY OF ATMOSPHERIC OPTICAL DATA TRANSMISSION SYSTEMS Abstract Only **c32**
Ye. R. Milyutin and Yu. I. Yaremenko *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 91 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 2, Feb. 1985 p 11-18 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

A procedure is developed for calculating the energy characteristics and the reliability of atmospheric data transmission systems operating in the optical range. The principal energy characteristic is the energy loss, which determines the signal attenuation in the optical channel. This parameter is evaluated in accordance with Bouguer's law, combining molecular absorption and scattering with absorption and scattering by aerosol particles. The aerosol contribution to attenuation is evaluated on the basis of a single universal parameter, namely the meteorological visibility range. Into account is taken the effect of atmospheric turbulence on both diffraction and refraction of light. For calculation of the reliability is needed the probability distribution of energy losses in the atmospheric channel. The probability of the losses exceeding the acceptable threshold level can be easily found when the general law of their probability distribution is known. The procedure has been formalized in a 9-step algorithm which yields both signal attenuation and system reliability for given transmitter output power and minimum receiver input power. The design problem of ensuring a prescribed level of interference immunity is not considered here and the minimum receiver input power is assumed to have already been determined.
Author

N86-15471# Joint Publications Research Service, Arlington, Va.
SELECTION OF SIGNALS FOR DIGITAL OPTICAL CHANNEL Abstract Only **c32**
S. Ye. Fedorov and A. N. Martyanov *In its* USSR Report:

Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 91-92 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 30, no. 1, Jan. 1985 p 139-147 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

Optimum selection of signals for digital optical communication channels is considered on the basis of the maximum likelihood difference rather than the Bayes average risk as criterion. One among M > oo equiprobable ones is to be sent into the channel within a time interval O < or = t < or = T. The detection process in the receiver is treated as testing of hypotheses according to the quantum theory, namely as a sequence of three operations with the electromagnetic field of signals and interference describable by nonnegative-definite operators in the Hilbert space. The first operation, measuring this electromagnetic field in subspace A of the Hilbert vector space H, is followed by calculation of the likelihood functions, which are then compared with one another for selection of the signal with the largest one. In the case of ambiguity it is necessary to randomize the selection. Optimization of such signals for a channel without thermal noise on the basis of minimum mean error probability or on the basis of maximum likelihood difference yields orthogonal signals, while optimization for a coherent channel yields antiphasal signals. B.W.

N86-15472# Joint Publications Research Service, Arlington, Va.
EFFICIENCY OF COHERENT RECEPTION OF OPTICAL SIGNAL PROPAGATING THROUGH TURBULENT ATMOSPHERE Abstract Only **c32**
V. A. Bureyev, V. Ye. Kirakosyants, and V. A. Loginov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 93 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 30, no. 1, Jan. 1985 p 90-93 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

A multichannel heterodyne receiver with a compound telescope is considered for coherent reception of optical signals propagating through a turbulent atmosphere, each of its N identical channels consisting of an entrance lens with a filter before the heterodyne and a photodetector followed by an intermediate-frequency filter and an envelope detector behind it. The efficiency of such a receiver is calculated on the basis of two alternative models, with a random phase only in the first model and with not only a random phase but also a random amplitude subject to Rayleigh fluctuation in the second model. Calculations on the basis of the first model yield a lower missed-hit probability at a fixed false-alarm probability, except in the range of few photodetector readings where it is equal to or higher than according to the second model. A comparison with a single-channel receiver indicates a much higher detection efficiency of a multichannel one in terms of missed-hit probability, the optimum number of channels being selected on the basis of maximum signal-to-noise ratio. B.W.

N86-15473# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENCE AND TECHNOLOGY
5 Nov. 1985 53 p refs Transl. into ENGLISH from various East European articles
(JPRS-ESA-85-033) Avail: NTIS HC A04/MF A01

Progress in East European Science and Technology is reported. Topics discussed include: microelectronics, computer program systems, programming languaes, information networks, electroluminescence display, cryogenics, automatic control, computer networks, semiconductors, computerized control. For individual titles, see N86-15474 through N86-15477.

N86-15474# Joint Publications Research Service, Arlington, Va.
ROBOTRON HARDWARE COMPATIBLE PROGRAMMING LANGUAGES SURVEYED **c60**
W. Nyderle *In its* East Europe Report: Science and Technology (JPRS-ESA-85-033) 5 Nov. 1985 p 9-13 refs Transl. into ENGLISH from Neue Technik im Buero (East Berlin, East Germany), v. 29, no. 4, 1985 p 116-117 (For primary document see N86-15473 06-31)
Avail: NTIS HC A04/MF A01

The use of higher-level programming languages is an essential and decisive prerequisite for rationalizing software development. Programming languages enable developing portable software and help reduce development time and maintenance costs. Problem-oriented programming languages will be in future completely replace assembler languages in software development. The decline in importance of assembler languages is indicated and this trend is speeded up especially by the incompatibility of microprocessor generations. Today, all the common programming languages are available on microcomputers. Compilers of higher-level programming languages are shown to be the most successful software tools. It is recommended they must be extended by tools which support program design, interface testing and program testing.
E.A.K.

N86-15475# Joint Publications Research Service, Arlington, Va.
CALL TO EXPAND INFORMATION NETWORK FOR BASIC RESEARCH **c82**
Joachim Kramer *In its* East Europe Report: Science and Technology (JPRS-ESA-85-033) 5 Nov. 1985 p 14-20 refs Transl. into ENGLISH from Das Hochschulwesen (East Berlin, East Germany), v. 33, no. 6, Jun. 1985 p 168-171 (For primary document see N86-15473 06-31)
Avail: NTIS HC A04/MF A01

Contributions to the acceleration of scientific-technical progress by modern technologies of production processes are outlined. The potential is given two essential challenges: (1) to achieve results that, in the sense of fundamental solutions, contribute to the sciences' own development, determine development directions, insure instruction on a high level, lay long-range foundations for technically applicable results and; (2) to make apt achievements within shorter time spans, so that they may result in effects on the national economy as they are made part of the national restructuring process as new technologies or products. There is a special need for achievements that are sufficiently superior to the international state of technology and are suitable to have important long-range effects, especially on production and export. E.A.K.

N86-15476# Joint Publications Research Service, Arlington, Va.
GDR SCIENTISTS DEVELOP ELECTROLUMINESCENCE DISPLAY **c33**
Christian Waldner *In its* East Europe Report: Science and Technology (JPRS-ESA-85-033) 5 Nov. 1985 p 21-22 Transl. into ENGLISH from Volksstimme (Magdeburg, East Germany), 20 Jun. 1985 p 4 (For primary document see N86-15473 06-31)
Avail: NTIS HC A04/MF A01

Electroluminescence display devices were developed. A laboratory technology was developed which allowed the manufacturing of models of such a display. In the displays the conversion is accomplished by a very thin layer consisting of a semiconducting compound which is based upon a glass support only a few millimeters in thickness. This thin film, embedded in equally thin layers of insulation, is covered with a superfine lattice of electrode strips. The light emitting diodes (LED) have advantages over the liquid crystal displays in high contrast and greater brightness.
E.A.K.

N86-15477# Joint Publications Research Service, Arlington, Va.
SCIENTISTS CITE USES OF CRYOGENICS, LOW TEMPERATURE MEASUREMENT
Rudolf Knoener and Reinhold Weiss *In its* East Europe Report: Science and Technology (JPRS-ESA-85-033) 5 Nov. 1985 p 25-27 Transl. into ENGLISH from Neues Deutschland (East Berlin, East Germany), 27-28 Jul. 1985 p 8 (For primary document see N86-15473 06-31)
Avail: NTIS HC A04/MF A01

Temperatures means the phenomena and processes occurring at temperatures below 120 K. Cryogenics deals with the production and the technical and technological application of temperatures below 120 K, in contrast to refrigeration technology, which is responsible for the temperature level above that. In the production of very low temperatures the efficiency of refrigeration machines declines as temperatures fall and that a temperature of absolute

zero can never be reached. It means that lowering the temperature to -100 degrees Celsius is substantially more expensive than increasing the temperature to +100 degrees Celsius. In attempting ever-lower temperatures completely novel natural phenomena are observed. The physical properties of a great many materials change drastically when temperatures are lowered significantly. The change in the mechanical properties of metals with temperatures causes high-alloy steels to be used in low-temperature facilities to preclude the brittle breaking of structural parts. Low temperatures are important in electrical engineering, where they can increase the electrical conductivity of the metals copper and aluminum, the conductors most used, by a factor of 10 with the lowering of the temperature to 80 K. E.A.K.

N86-15478# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
20 Nov. 1985 103 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-040) Avail: NTIS HC A06/MF A01

China Reports - Science and Technology, 20 November 1985 (JPRS-CST-85-040) contains articles on the Chinese Patent System, Computer Sciences, Isotope Chemistry, Acoustics, Aerodynamics, and Metallurgy. Of particular interest in this issue are items related to Computer Science, Research and image processing. For individual titles, see N86-15479 through N86-15483.

N86-15479# Joint Publications Research Service, Arlington, Va.
MC68000 MONITOR PROGRAM DISASSEMBLED c61
Yuan Hongchun *In its* China Report: Science and Technology (JPRS-CST-85-040) 20 Nov. 1985 p 6-18 Transl. into ENGLISH from Weixing Jisuanji (Chongqing, China), no. 2, 14 Mar. 1985 p 102-107 (For primary document see N86-15478 06-31)
Avail: NTIS HC A06/MF A01

A monitor for the MC68000 single board microcomputer has been developed. It is the DJS-0600N 16-bit single bord microcomputer, which underwent technical evaluation in July 1984, and is now being produced in small quantities at State Factory 830. The original MC68000 twenty-six monitor command inventory was broken down, analyzed, and adapted for the new monitor. F.M.R.

N86-15480# Joint Publications Research Service, Arlington, Va.
MICROPROCESSOR APPLICATION IN ERROR CODE CORRECTION c61
Zhou Dahua and Liu Yuqin *In its* China Report: Science and Technology (JPRS-CST-85-040) 20 Nov. 1985 p 19-32 refs Transl. into ENGLISH from Dianzi Kexue Jishu (Beijing, China), v. 15, 10 Feb. 1985 p 2-8 (For primary document see N86-15478 06-31)
Avail: NTIS HC A06/MF A01

Microprocessor software is used to correct error codes. Hamming code and cyclic code are interwoven to correct 8 bits of burst error. Thus, the use of complicated equipment required in the conventional interweaving method can be avoided. Author

N86-15481# Joint Publications Research Service, Arlington, Va.
NOVEL CONTROL CIRCUIT FOR PROXIMITY FOCUSED MICROCHANNEL PLATE IMAGE INTENSIFIERS c33
Zhou Xuan *In its* China Report: Science and Technology (JPRS-CST-85-040) 20 Nov. 1985 p 33-44 refs Transl. into ENGLISH from Dianzi Kexue Xuekan (Beijing, China), v. 6, no. 6, Nov. 1984 p 473-480 (For primary document see N86-15478 06-31)
Avail: NTIS HC A06/MF A01

A microchannel plate image intensifier and a gating pulse generator, which controls its shutter effect, constitute a super high-speed camera with high gain and fast response. A comparison of three pulse control modes for a typical second generation image intensifier (18 mm, Model ITT-F4111 image intensifier) is made. Based on the comparison, a novel control circuit for gating the photocathode of the image intensifier, as well as capable of generating high amplitude nanosecond pulses, is introduced. It is experimentally determined that the exposure time of the camera could reach approximately 2 ns by using this control generator. In addition, the paper discusses the match between the generator and the image intensifier. Furthermore, a simple and effective method is introduced to eliminate multiple exposures which are to be avoided in single shot photography. Author

N86-15482# Joint Publications Research Service, Arlington, Va.
DELAY EFFECT IN PULSED AVALANCHE DISCHARGE OF AN XeCl LASER AT HIGH GAS PRESSURE c36
Lou Qihong *In its* China Report: Science and Technology (JPRS-CST-85-040) 20 Nov. 1985 p 45-49 refs Transl. into ENGLISH from Wuli Xuebao (Beijing, China), v. 34, no. 7, Jul. 1985 p 960-963 (For primary document see N86-15478 06-31)
Avail: NTIS HC A06/MF A01

The pulsed avalanche discharge process in an XeCl laser at pressures up to 10 atm is analyzed and the effect of the delay phase on discharge formation time is discussed. By comparison with experimental results for a pulsed avalanche discharge in an XeCl laser, a critical avalanche track length of about 1 mm is derived. Author

N86-15483# Joint Publications Research Service, Arlington, Va.
PSEUDOINVERSE RESTORATION OF BLURRED IMAGE IN UNIFORM MOTION c64
Si Xianyu, Zhang Guanshen, Zhang Shaoying, and Li Yongguo *In its* China Report: Science and Technology (JPRS-CST-85-040) 20 Nov. 1985 p 50-56 refs Transl. into ENGLISH from Journal of Sichuan Univ. Natural Science Edition (Chengdu, China), no. 2, 1985 p 44-49 (For primary document see N86-15478 06-31)
Avail: NTIS HC A06/MF A01

Earlier mistakes in the iteration formula for the restoration of blurred images in uniform motion are identified. The correct formula is given. In addition, a pseudoinverse restoration method, which adds a corrected image to a basic image, is introduced. Results obtained from the computer show that this method is effective. Author

N86-15484# Joint Publications Research Service, Arlington, Va.
USSR REPORT: ELECTRONICS AND ELECTRICAL ENGINEERING Abstracts Only
24 Oct. 1985 92 p Transl. into ENGLISH from various Russian articles
(JPRS-UEE-85-011) Avail: NTIS HC A05/MF A01

USSR Reports, Electronics and Electrical Engineering, 24 October 1985, (JPRS-UEE-85-011) contains reports on solid state circuits, communications, electromagnetic compatibility, electron devices, microwave theory and techniques, industrial electronics and control instrumentation, magnetics, computers, power engineering, quantum electronics, electro-optics, and antennas and propagation. Of special interest in this issue are articles on semiconductor circuits, MOS structures, performance prediction in transistors, integrated circuits, and large-scale integration circuits, oscillators with multifrequency SAW resonators, stroboscopic transducers, changes in semiconductors during optical pumping, dynamic characteristics of tristable-logic integrated circuits, error reduction in integrated-circuit CMOS switches, and indoor radio telemetry. For individual titles, see N86-15485 through N86-15513.

N86-15485# Joint Publications Research Service, Arlington, Va.
SURFACE PASSIVATION OF SEMICONDUCTOR CIRCUIT ELEMENTS WITH LAYER OF WIDEBAND SEMICONDUCTOR Abstract Only c33
B. I. Sysoyev, N. N. Bezryakin, A. S. Dronov, and A. P. Rovinskiy *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 2-3 Transl. into ENGLISH from Mikroelektronika (Moscow, USSR), v. 14, no. 2, Mar. - Apr. 1985 p 140-143 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

Protective surface passivation of semiconductor elements for circuit integration is studied experimentally on Al-SiO2-ZnP2-Si structures and evaluated theoretically on the basis of the MOS*S-structure model. Specimens for this study are built on n-Si and

p-Si single crystals with high electrical resistivity rho approx. = 7.75 ohm.cm) and with orientation in the <111> plane or the <100> plane. Layers of beta-ZnP2 are deposited by vacuum evaporation to various thicknesses of 0.1 to 1.2 microns. Data on charge redistribution in the ZnP2-Si system are obtained by measurement of high-frequency capacitance-voltage characteristics, 1 MHz having been empirically found to be the most suitable test frequency. The results reveal that the capacitance of structures on high-resistivity silicon depends on both the magnitude and the sign of dV/dt, unlike the capacitance of structures on strongly doped low-resistivity (rho - 0.01 ohm.cm) silicon, this dependence being related to modulation of the space-charge region in the Si substrate. The state of this space-charge region in an Al-SiO2-ZnP2-Si structure almost corresponds to the state of flat energy bands. With a thin ZnP sublayer (d < 0.4 micrometers, this space-charge region is controlled even by a dV/dtt < 0.01 V/s. With a thick ZnP2 sublayer (d > 2L sub Dubye), on the other hand, the charge in the SiO2 layer has almost no influence on the state of the space-charge region in the Si layer. Therefore, a sufficiently thick ZnP2 sublayer (d > 0.7 micrometer) ensures a voltage-independent capacitance of the structure approximately corresponding to the state of flat energy bands in Si. Author

N86-15486# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF ELECTROPHYSICAL AND PHOTOELECTRIC PROPERTIES OF MOS-STRUCTURES ON INDIUM ARSENIDE Abstract Only **c33**
Ye. A. Loskutova, V. N. Davydov, and T. D. Lezina *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 3-4 Transl. into ENGLISH from Mikroelektronika (Moscow, USSR), v. 14, no. 2, Mar. - Apr. 1985 p 134-139 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

An experimental study is made of MOS-structures on InAs, for an exploration of their electrophysical and photoelectric characteristics. Specimens are prepared from n-InAs single crystals with a [111] orientation and a donor concentration of 1.6 10 to the 16th power cu cm. Their chemico-mechanically and mechanically polished surfaces are oxidized galvanostatically in a 20% solution of orthophosphoric acid on ethylene glycol with an anodizing current density of 1 A/sq. cm., until a 0.1 micrometers thick anodic oxide film characterized by a breakdown voltage of 40 to 50 V and a leakage current of 10 to the -10 power A/sq. cm builds up. A semitransparent nickel electrode is deposited by vacuum evaporation. The capacitance-voltage characteristics are measured by the frequency-divider method at 1 MHz, with no capacitance dispersion found over the 300 kHz to 10 MHz range. The photo-emf is measured with a light-activated diode at the 0.95 micrometers wavelength and a 70 Hz modulation frequency. The data obtained include voltage of the flat energy bands and hysteresis of the capacitance-voltage characteristic on both positive and negative halves of the voltage sweep (-14 V yields 0 yields +14 V) at a constant reverse bias (-5 V), spectrum of surface states and voltage dependence of the small-signal photo-emf over the -10-(-2) V range at various voltage sweep rates, also dependence of the photo-emf on the frequency of radiation intensity modulation at various field-electrode voltages and temperature dependence of the photo-emf under weak and strong inversion of the InAs surface. Author

N86-15487# Joint Publications Research Service, Arlington, Va.
PREDICTING AND DIAGNOSING PERFORMANCE OF TRANSISTORS, INTEGRATED CIRCUITS AND LARGE-SCALE-INTEGRATION SYSTEMS BY MULTILEVEL SIMULATION METHODS AND PROGRAMS Abstract Only **c33**
A. N. Bubennikov, B. N. Mitashev, and A. D. Sadovnikov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 5 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 3, Mar. 1985 p 3-7 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

Application of multilevel simulation methods and programs to discrete transistors as well as to integrated circuits and large-scale-integration systems is considered, for effective performance and reliability evaluation on the basis of technological, physico-topological, or componential models. To predict and diagnose the behavior of such devices, it is necessary to determine the sensitivity of electrical characteristics on design, structural, and fabrication factors. The most important factors are increase of the perimeter-to-area ratio of the emitter, adequately high doping levels in all three emitter-base-collector regions, and moderately high collector-junction breakdown voltage. Multilevel simulation by the method of informative parameters makes it possible to estimate relative increases of the surface-recombination component of the base current, relative increases of the peripheral minority-carrier injection current, effects of high doping and injection levels, and effects of low collector-junction breakdown voltage of thin-film semiconductor structures. Author

N86-15488# Joint Publications Research Service, Arlington, Va.
NONSINUSOIDAL MODES OF OSCILLATOR WITH MULTIFREQUENCY SURFACE-ACOUSTIC-WAVE RESONATOR Abstract Only **c33**
G. L. Gurevich, L. N. Zhizhenkova, V. M. Pashkin, and A. M. Spasyuk *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 6 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 30, no. 3, Mar. 1985 p 604-611 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

Quartz resonators for stabilization of oscillators are being replaced by SAW resonators, because the latter can operate at higher frequencies with the same high stability and are technologically more advantageous. A multifrequency SAW resonator is considered as a means of producing tunable monochromatic signals for such applications as frequency synthesizers and multistate memories. Such a resonator is also capable of producing simultaneous oscillations at several frequencies resulting in a modulated and thus nonsinusoidal output signal. Such a resonator is formed by a pair of interdigital electroacoustic transducers with a highly inductive load each, to ensure a high reflection coefficient, and with feedback through a unidirectional amplifier between them for compensation of losses. Its performance is analyzed on the basis of the admittance matrix which relates currents and voltages in the equivalent electric circuit. Steady state and transients are included in the general analysis. Author

N86-15489# Joint Publications Research Service, Arlington, Va.
NOISE CHARACTERISTICS OF STROBOSCOPIC TRANSDUCERS BUILT WITH GaAs MICROCIRCUIT INTEGRATION Abstract Only **c33**
V. I. Staroselskiy *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 7-8 Transl. into ENGLISH from Mikroelektronika (Moscow, USSR), v. 14, no. 2, Mar. - Apr. 1985 p 162-168 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

Stroboscopic transducers are used for measuring electric signals over a wide frequency range, the sensitivity of these devices being largely determined by the equivalent input noise voltage. The internal noise level can be appreciably lowered and the performance of such a transducer correspondingly improved by GaAs microcircuit integration of the input stage. A chip of 1x1 sq mm area can carry a mixer bridge of four Schottky-barrier diodes, a storing capacitor with discharge circuit, and a voltage repeater on Schottky-gate field-effect transistors, shot noise in the mixer diodes, and flicker noise in the diodes as well as in the voltage repeater. Two noise mechanisms are identified, corresponding to the two modes of transducer operation: mixer noise alone during strobing, mixer noise with noise in the discharge circuit and in the voltage repeater during measurement of widened pulses. The resultant spectral noise density is calculated on the basis of these identifications and corresponding equivalent circuit diagrams. During strobing the flicker noise appears as a multiplicative component and its deviation from the 1/omega law determines its lower frequency limit. During measurement of a widened pulse the noise

is limited to the pass band of the output amplifier-integrator stage and a low-pass filter before this stage becomes desirable. Author

N86-15490# Joint Publications Research Service, Arlington, Va.
STRUCTURAL TRANSFORMATIONS IN SEMICONDUCTORS DURING OPTICAL PUMPING Abstract Only **c33**
Yu. V. Kopayev, V. v. Menyaylenko, and S. N. Molotkov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 8-9 Transl. into ENGLISH from Mikroelektronika (Moscow, USSR), v. 14, no. 2, Mar. - Apr. 1985 p 153-161 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

Phase transformations in AIVBVI semiconductors which occur during irradiation by a laser beam are analyzed on the basis of a theoretical model with the electron energy-band spectrum in the zeroth-order approximation and with the coupling in p-orbitals assumed to be strong, a characteristic feature of AIVBVI semiconductors being their deviation from stoichiometry and a consequently high doping level. Instability of their cubic lattice stems from the behavior of the Fermi surface in the hypothetical metallic initial phase. Distortion of the cubic lattice is accounted for by the phase potential. With the difference between A and B atoms disregarded, the electron spectrum corresponds to three one-dimensional half-filled energy bands. Nonequilvance of A and B atoms is then taken into account by introduction of the ionicity potential. Dependence of the energy gap on the ionicity level and on the doping level is established, whereupon the dependence of the energy gap on the pumping power is bound to be unique at ionicity levels below critical and ambiguous at ionicity levels above critical. Laser pumping evidently weakens the effect of doping.
Author

N86-15491# Joint Publications Research Service, Arlington, Va.
METHODOLOGY FOR DETERMINING DYNAMIC CHARACTERISTICS OF TRISTABLE-LOGIC INTEGRATED CIRCUITS Abstract Only **c33**
A. M. Pashayev and A. R. Adzhalov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 9 Transl. into ENGLISH from Mikroelektronika (Moscow, USSR), v. 14, no. 2, Mar. - Apr. 1985 p 169-170 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

The problem of determining the dynamic characteristics of integrated-circuit transistor-transistor logic with three stable states is considered. The third state besides logic 1 and logic 0 is a high-impedance open-circuit state equivalent to that of a relay with normally open contact. Measurement of the dynamic characteristics in this state is very difficult, even with automatic or semiautomatic instruments, because the INHABIT potential of an input pulse cannot be established with sufficient accuracy. There has therefore been proposed determination by prediction on the basis of a set of output parameters, using analytical relations between electrical parameters along with functional relations as well as correlations between parameters of the integrated circuit and those of its components. In tests, moreover, one will use statistical distributions of integrated-circuit parameters. According to this methodology, within prescribed tolerances on easily measurable dynamic parameters in the resolving state, one can calculate other parameters such as the signal-propagation delay time with a guaranteed probability of 0.9937 according to the three sigma rule.
Author

N86-15492# Joint Publications Research Service, Arlington, Va.
REDUCING DYNAMIC ERRORS OF INTEGRATED-CIRCUIT CMOS SWITCHES Abstract Only **c33**
A. A. Danilov and D. Ye. Polonnikov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 10 Transl. into ENGLISH from Mikroelektronika (Moscow, USSR), v. 14, no. 2, Mar. - Apr. 1985 p 178-179 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

Analog CMOS switches and commutators such as those of series 590 and 571 feature high open-state resistance, low and nonlinear conducting-state resistance, low residual voltage, bidirectionality, potential coupling between switch or commutator circuit and control circuit, high speed, and voltage as well as current switching capability. Their major drawbacks are high interference level and long transient period, high input and output capacitances, high temperature coefficient of resistance and appreciable open-circuit leakage current. An analysis of an inverter-controlled CMOS transistor pair reveals that interference signals generated by passage of the control-voltage pulsefront through the gate-channel capacitances in the two complementary transistors, successively, do not compensate one another but add up. At the same time, the main cause of a slow output signal transient are transients in the control circuit which prolong the rise time of the control-voltage pulse. The oscillatory transient with overshoots travels through the gates to the channels, subsequently appearing across the switch resistance and thus prolonging the output signal transient.
Author

N86-15493# Joint Publications Research Service, Arlington, Va.
OPTIMUM FREQUENCY OF COMMUNICATION CHANNEL FOR INDOOR RADIO TELEMETRY Abstract Only **c17**
A. A. Kvitka, B. I. Podlepetskiy, and S. D. Chernysheva *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 14 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 3, Mar. 1985 p 70-73 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

A major problem in application of radiotelemetry to biological research and medical practice is indoor interference caused by superposition of forward and reflected waves, with resulting signal fadeout. Avoidance of this effect requires that the radio transmitter operate at the optimum signal wavelength and the radio receiver be placed in the optimum location. A method of determining both is proposed on the basis of an experimental study and a theoretical model. Measurements are made with the Prima radiotelemetry system developed and built by A. A. Kvitka with others and V6-1 selective microvoltmeter, in an 8x5x3.5 cu m large room where the radio receiver is placed successively in three different locations (first in corner 0,0,0 m, then closer to the center 2.5,1.5,1.0 m and 1.25,0.75,1.0 m) while the radio transmitter on a dielectric post is moved around in 0.25 m steps successively in three horizontal planes 1, 1.5, 2 m, respectively, above the floor. Measurements are made at eight frequencies (60, 30, 20, 15, 12, 10, 8.89, 7.5 MHz).
Author

N86-15494# Joint Publications Research Service, Arlington, Va.
MAIN TRENDS IN SATELLITE COMMUNICATION AND BROADCASTING RESEARCH Abstract Only **c32**
Yu. B. Zubarev and L. Ya. Kantor *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 16-17 Transl. into ENGLISH from Elektrosvyaz (Moscow, USSR), no. 5, May 1985 p 15-18 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

The main advantages of satellite communication systems are possibility of multiple-call communication over a wide geographical zone, multistation access to a common satellite trunk resulting in a high utilization factor, formation of direct channels between any ground stations, commutation of floating channels in the time domain according to demand, and elimination of the distance between ground stations as a factor influencing the channel quality and cost. Satellite communication systems also have physically inherent drawbacks, namely a long signal delay of up to 300 ms in geostationary of Molniya systems, a Doppler frequency shift of up to + or - 10 to the minus 8 power in a geostationary orbit or up to + or - 10 to the minus 5 power in an elliptical orbit, and predictable short interruptions caused by solar effects on the antennas of ground stations or during necessary switching from one satellite to another. With the advantages well established and the drawbacks taken into consideration, a major effort is underway to fit satellite communication into the Unified Automatic Communication Network. One promising development is television broadcasting via satellite, which requires a channel within the

12 GHz frequency band and a narrow beam so as to facilitate broadcasting of republic-wide programs and reception of more nationwide programs within any given broadcast zone where no more channels within the Ekran, Moskva, Orbita frequency bands are available. B.W.

N86-15495# Joint Publications Research Service, Arlington, Va.
TRANSMISSION OF TELEVISION SIGNALS OVER OPTICAL COMMUNICATION CHANNEL BY MEANS OF FREQUENCY MODULATION Abstract Only **c32**
Yu. M. Kirik, M. I. Krivosheyev, Yu. I. Marimont, Yu. A. Kharitonova, A. I. Shlayn, and Ye. A. Shchervakov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 17 Transl. into ENGLISH from Elektrosvyaz (Moscow, USSR), no. 5, May 1985 p 28-30 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

Frequency modulation is considered as means of transmitting television signals over fiber-optic communication channels, because this method remains viable in nonlinear channels and retains a high signal-to-noise ratio even at a high modulation index. Its advantage over pulse-rate modulation, also an effective method for this application, is that a much narrower frequency band suffices and no special modem equipment needs to be installed. The signal-to-noise ratio is in this case defined as the ratio of image signal voltage squared to weighted noise signal squared. It is calculated here accordingly, at the subcarrier frequency, for a receiver channel with an avalanche photodiode as current source or with a p-i-n photodiode as a special case with unity mean avalanche multiplication factor. An experimental verification was made with a 32DL103 semiconductor laser emitting radiation at the 0.85 micrometer wavelength and a 0 to 60 dB adjustable light intensity attenuator on the transmitter side. On the receiver side was used a germanium or silicon photodiode and an intermediate-frequency pre-amplifier in a common housing, the first stage of the preamplifier built on a field-effect transistor with an input impedance of 400 ohms resistive after compensation of the input capacitance by a circuit with a 30 MHz bandwidth at the 70 MHz center frequency. B.W.

N86-15496# Joint Publications Research Service, Arlington, Va.
APPARATUS FOR EXPERIMENTAL STUDY OF HIGH-RESOLUTION RADIOMETERS AND THEIR CHARACTERISTICS Abstract Only **c35**
A. V. Afonin, A. P. Zakharnev, and G. I. Muravyeva *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 24 Transl. into ENGLISH from Optiko-Mekhanicheskaya Promyshlennost (Leningrad, USSR), no. 1, Jan. 1985 p 33-35 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

A test stand has been developed and built for determining the characteristics of high-resolution optoelectronic instruments such as radiometers experimentally. Its main optical components are a collimator with a telephoto lens of 4544 mm focal length, for simulating an infinitely far object of 5 inches angular width. Optical fibers of a light collector-conductor are placed with their glowing exit apertures between the focal plane and the first optical surface of that lens so that their distance from the entrance pupil of a tested instrument can be simulated at a distance from 2.5 m to infinity. Other optical components include a lamp, a modulator followed by a condenser lens between the lamp and the entrance aperture of the fiber-optic bundle, two external point light sources, an objective which together with two fixed-and-scanning mirror pairs produces moving images of these sources, a luminaire, a shield, a photometric sphere with the luminance of its window controllable over the 10 to the minus 4 power - 250 cd/sq m range, a light-splitter plate before the photometer window, and a light-activated diode operating in the pulse mode for measuring the transfer characteristics of the tested instrument. The test stand was used for determining the pulse response characteristic of a scanning radiometer with a 40 inches wide field of vision. B.W.

N86-15497# Joint Publications Research Service, Arlington, Va.
FREQUENCY CHARACTERISTICS OF DIFFERENTIAL OPTRON Abstract Only **c33**
A. K. Mamedov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 25 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 3, Mar. 1985 p 76-78 Original language document was announced in IAA as A85-34176 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

An experimental study of the frequency response of an optopair of differential optrons of type KOD301 is presented. It is shown that good agreement between the transfer characteristics of the main and auxiliary optopairs is maintained in the frequency band. The optopair mode of operation that provides for minimum time lag is defined. B.J. (IAA)

N86-15498# Joint Publications Research Service, Arlington, Va.
HIGH-POWER SOURCES WITH SMOOTHLY ADJUSTABLE PULSE DURATION FOR POWERING GAS-DISCHARGE TUBES OF LASER PUMPING SYSTEMS Abstract Only **c36**
V. M. Vakulenko, L. P. Ivanov, Yu. A. Ganshin, I. L. Karpyshev, and V. A. Korneyev *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 29-30 Transl. into ENGLISH from Elektrotekhnika (Moscow, USSR), no. 3, Mar. 1985 p 19-20 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

A series of power supplies for gas-discharge tubes in laser pumping systems has been developed on the basis of the same circuit but with different levels of partial discharge of the capacitive energy storing device. The charger converts the a.c. network voltage into a constant current, very efficiently and at the same charging rate regardless of the discharge level. An overall size and weight reduction is made possible by an intermediate frequency conversion from 50 Hz to 1 kHz, which also allows raising the repetition rate of output pulses. The charger consists of an inverter and a rectifier. The parallel-type inverter includes a thyristor-diode bridge with capacitors and a transformer, and a choke coil, for converting the sine-wave a.c. network voltage into a higher-frequency (1 kHz) square-wave alternating one after the first rectifying it. An important feature here is stiff overvoltage suppression, especially across the switching capacitors, during wide swings such as from no load to full load. The rectifier includes a 300/1000 V step-up transformer with another thyristor-diode bridge and a choke coil in series. A discharge commutator across the rectifier output shunted by a filter-capacitance ensures proper cutoff of the charge discharge current and corresponding control of the pulse duration. B.W.

N86-15499# Joint Publications Research Service, Arlington, Va.
HIGH-POWER PULSE GENERATOR WITH PULSEFORM CONTROL FOR POWERING GAS-DISCHARGE TUBES OF LASER PUMPING SYSTEMS Abstract Only **c36**
L. P. Ivanov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 30-31 Transl. into ENGLISH from Elektrotekhnika (Moscow, USSR), no. 3, Mar. 1985 p 21-22 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

A power pulse generator with controllability of the pulseform as well as with regulation of the pulse amplitude, duration, and repetition rate is very desirable as a power supply for gas-discharge tubes of laser pumping systems. An outstanding example of such a generator is one which consists of split capacitive and inductive energy storing devices, with thyristors used for switching. The pulseform is varied by changing the connections between capacitive and inductive elements in the parallel-series grid and by regulation of the switching schedule. A typical generator consisting of five capacitors, seven thyristors (controlled rectifiers), four diodes (fixed rectifiers), and a choke coil can power a gas-discharge flash tube with a variety of pulses depending on the particular application. A welding laser, for instance, requires a pulse which peaks early its leading edge and then drops to a lower level so as to maintain the melt at a constant temperature before it falls along its trailing edge. A piercing laser requires a pulse which peaks late so as to

facilitate removal of the liquid phase of material from the hole, just before it falls along its trailing edge. B.W.

N86-15500# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF UNIDIRECTIONAL FERRITE MICROSTRIP LINES Abstract Only c32
P. P. Bobrov, A. V. Gidlevskiy, and Yu. A. Kirsanov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 32 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 3, Mar. 1985 p 64-67 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

An experimental study of unidirectional ferrite microstrip lines was made, for the purpose of determining their characteristic and input impedances as well as the effect of insertion of a lumped inhomogeneity on the unidirectional properties. The characteristic impedance was determined by comparison of a known lumped load impedance along the line with the input impedance near the free edge of the upper conductor, after measurement of the complex reflection coefficient as the ratio of output-to-input complex voltage amplitudes over the 1 to 3 GHz frequency range with a DK1-5 instrument and a 50 ohm standard S6-2A resistor (ceramic cylinder with absorbent coating layer of thickness equal to that of the ferrite substrate). The characteristic impedance was found to be low, within 3 to 5 ohms for the 60SCh ferrite material, and to thus limit the range of insertable amplifying or control elements. The data are useful for design optimization of rectifiers, circulators, attenuators, modulators and other nonreciprocal devices on microstrip lines. Author

N86-15501# Joint Publications Research Service, Arlington, Va.
SELF-MODULATION INSTABILITY OF GYROTRON EMISSION Abstract Only c35
G. S. Nusinovich and V. Ye. Zapevalov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 36 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 30, no. 3, Mar. 1985 p 563-570 Original language document was announced in IAA as A85-30487 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

A description is given of a method for analyzing the conditions of self-modulation instability (SMI) in a wide class of electron masers with resonators having a nearly equidistant spectrum of natural frequencies. It is shown that stable high-efficiency single-mode oscillation can be achieved in a gyrotron with an arbitrarily dense spectrum of competing modes. However, in the case of an arbitrary frequency distribution of competing modes, SMI arises if the magnitude of the beam current is more than twice that of the efficiency-optimal current under conditions of high-efficiency single-mode oscillation. B.J. (IAA)

N86-15502# Joint Publications Research Service, Arlington, Va.
ACTIVE MAGNETIC SUSPENSION IN MAIN MAGNETIC FIELD OF ELECTRIC MOTOR Abstract Only c33
I. D. Urusov, V. I. Galkin, and I. P. Likhoshvay *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 50 Transl. into ENGLISH from Elektrotekhnika (Moscow, USSR), no. 3, Mar. 1985 p 38-41 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

An active magnetic suspension for the rotor of an electric motor is considered, especially in small or miniature high-speed devices such as gyros, microturbomachines, and machine-tool spindle drives where it would eliminate the need for extra bearings and contribute to size and weight reduction. A disk-type rotor made of a ferromagnetic material is located horizontally inside the bore of a vertical stator so that weight and external loads compensate the magnetic pull upward. This pull is generated by the magnetic field in the air gap and can be automatically controlled by an electronic feedback circuit which regulates the stator input voltage depending on the rotor position along the stator bore, with a displacement transducer on the rotor indicating the position. The performance of such a suspension with automatic control in a 3-phase induction motor is analyzed on the basis of the system of differential equations describing the behavior of the electro-mechanical system during axial oscillations of the rotor, assuming a constant rotor speed during the transient periods. B.W.

N86-15503# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL MODELING OF MAIN LIGHTNING STAGE Abstract Only c47
B. N. Gorin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 53 Transl. into ENGLISH from Elektrichestvo (Moscow, USSR), no. 4, Apr. 1985 p 10-16 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

A mathematical model is constructed describing the main stage of lightning buildup. The corresponding system of two differential equations for the potential and the current, in the one-dimensional approximation, is based on the analog a spark in a long discharge gap and on a power function of time (power exponent $n = 1.5$ to 4) simulating the voltage transient. All parameters of the lightning channel are evaluated on the basis of applicable circuit relations and available data. The conductance is a function of the electric charge present as well as on the current pulse characteristics (rise time, amplitude, half-fall time), while the inductance is approximately constant and equal to that of an equivalent vertical conductor. The dynamic capacitance is more difficult to determine, requiring an analysis of the streamer field and the neutralization process. Reasonable assumptions are made regarding the electric field in a cylindrical vertical channel and, with all necessary parameters established, the system of equations is reduced to a form suitable for computer-aided numerical solution by the method of characteristics. Author

N86-15504# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF ELECTROMAGNETIC FORCES IN MAGNETIC FIELD CALCULATIONS Abstract Only c32
A. G. Nazaryan, A. L. Mailyan, and E. Kh. Adzhemyan *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 54-55 Transl. into ENGLISH from Elektrichestvo (Moscow, USSR), no. 4, Apr. 1985 p 58-60 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

A procedure is outlined for determining the electromagnetic force in the equation of motion for an electrical machine. Instead of approximating the inductance, the force is determined directly from the magnetic field distribution corresponding to a specific relative position of the electromechanical system components. The field pattern is most intricate, with the magnetic induction changing most abruptly, in the regions of strong fringing at corners of teeth or salient poles in the air gap. Calculations for plotting the magnetic field by the method of finite elements or finite differences yields most accurate results when the selected surfaces pass through points where components of magnetic induction have discontinuities or overshoots. The procedure is demonstrated on a machine with rectangular slots on both sides of the air gap and with the magnetic cores made of E1A steel. The magnetization curves for all components of the ferromagnetic structure are approximated. In calculating electromagnetic forces on the conductors in slots by this method, it has been found to be most expedient to treat them as tension forces. Author

N86-15505# Joint Publications Research Service, Arlington, Va.
PULSE-TYPE VOLTAGE STABILIZER WITH INTEGRAL PULSE-WIDTH MODULATION Abstract Only c33
I. A. Fedorova, A. P. Kuznetsov, and L. Yu. Shilin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 55-56 Transl. into ENGLISH from Elektrichestvo (Moscow, USSR), no. 4, Apr. 1985 p 60-61 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

A voltage stabilizer with integral pulse width modulation consists of a power amplifier followed by a low pass filter for the line voltage, a reference oscillator and a variable ratio frequency divider, and a pulse phase detector which performs the integral control

by comparing the two incoming signals from the reference oscillator and the frequency divider respectively, and feeds the mismatch signal to the power amplifier. The operation of such a voltage stabilizer is best analyzed on the basis of a system of two equations describing respectively the state vector and the output signal of its continuous linear amplifier filter part, assuming that the latter has a constant structure, as functions of time. From these equations and the law of unipolar integral pulse width modulation are obtained the performance characteristics of the voltage stabilizer in the locking mode. The error load characteristic and the stability limits as well as the locking band of a voltage stabilizer whose continuous linear part has the simplest transfer function indicate that there is an optimum load resistance corresponding to the minimum stabilizer error. An increase of the load resistance will gradually increase the error until the locking and stabilization limit is exceeded. A decrease of the load resistance below that optimum will actuate the overload protection and thus cut out the voltage stabilizer altogether. Author

N86-15506# Joint Publications Research Service, Arlington, Va.
PROPERTIES OF OPTICAL FILTERS ON CdSe-HgSe BASE Abstract Only **c74**
N. P. Gavaleshko, S. Yu. Paranchich, L. D. Paranchich, and V. G. Antoshchuk *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 58-59 Transl. into ENGLISH from Optiko-Mekhanicheskaya Promyshlennost Leningrad, USSR), no. 1, Jan. 1985 p 10-11 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

The two compounds CdSe and HgSe form pseudobinary alloys Cd sub x Hg sub 1 - x Se whose energy gap and refractive index depend on the composition and the temperature. The filter properties of these materials were measured in an experimental study, to determine the suitability of such filters for matching infrared devices with the window in the atmosphere. Their transmission spectra, wavelength dependence of the transmission coefficient over the 2 to 8 micrometer range, were measured at 300 K and at 80 K. They were also measured before and after heat treatment at 200 C for 50 h in vacuum or in mercury vapor as well as before and after clearing with SiO. The data yield the basic filter characteristics, namely the maximum transmission coefficient and the corresponding wavelength in a peaking spectrum or wavelength range in a flat spectrum. The data are also useful for stoichiometric control of the transmission band as well as the transmission level. The transmission coefficient increases with an increase of the cadmium content owing to an increase of the energy gap which in this system varies from 0 to 1.8 eV. Annealing in vacuum increases the transmission coefficient at the long-wave end and decreases the slope of the short-wave edge, annealing in mercury vapor having a similar effect on the short-wave edge. Author

N86-15507# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF HOLOGRAM ANALYZER WITH SINGLE-COMPONENT OPTICAL HOLOGRAM MATCHING SYSTEM Abstract Only **c35**
L. T. Mustafina, N. P. Kutikova, and N. B. Frantsuzova *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 62 Transl. into ENGLISH from Optiko-Mekhanicheskaya Promyshlennost (Leningrad, USSR), no. 4, Apr. 1985 p 8-10 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

A hologram analyzer is examined in which variable magnification of the image is achieved by placing the holograms in matched planes at close to twice the focal length of the single component optical system. The analyzer is made up of a light source, a rotating diffuser, a focusing lens, two holograms, a spatial filter, a matching lens, a receiving lens, a diaphragm, and the photographic film. The system permits arbitrary orientation of the interference bands with minimum distortions of the interacting wavefronts.
Author

N86-15508# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF ROUGHNESS OF ENDS OF FIBER OPTIC PLATES ON MODULATION TRANSFER COEFFICIENT Abstract Only **c74**
L. I. Vasin, A. V. Guzhevskaya, and D. K. Sattarov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 64 Transl. into ENGLISH from Optiko-Mekhanicheskaya Promyshlennost (Leningrad, USSR), no. 4, Apr. 1985 p 56-57 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

The modulation transfer coefficient is investigated for the series of selected spatial frequencies as a function of the roughness of the treated ends of fiber optic plates. Seven plates prepared from a single block of multiconductor light guides made of KBF10-VT046 glass were investigated. The investigations were performed by finding the modulation transfer coefficient of the polished plates, and comparing that value with the figure found after polishing one of the ends with one of a series of silicon carbide powders. It is found that the modulation transfer coefficient is the same, to within the measurement error, for all of the plates polished on the resin device; felt polished plates exhibit modulation transfer coefficients coinciding with those of other parts only in the low frequency region; at 25 lines per mm, the coefficient then becomes significantly lower than for any other plates. This indicates that the form of the working end, all otyher conditions being equal is a determining factor in transmitting the contrast of an image by a fiber optic part. Author

N86-15509# Joint Publications Research Service, Arlington, Va.
GENERATION OF ELECTROMAGNETIC RADIATION IN RADIO-FREQUENCY BAND IN SOLIDS EXPOSED TO LASER RADIATION Abstract Only **c76**
A. D. Pogrebnyak and S. V. Rakitin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 67 Transl. into ENGLISH from Izvestiya Akademii Nauk SSSR: Seriya Fizicheskaya (Moscow, USSR), v. 49, no. 4, Apr. 1985 p 773-775 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

The development of a stabilized fabrication process for shaping optical parts with aspherical surfaces having slight asphericity (of approximately 10 micrometers using a mask during the polishing process by taking the asphericity allowance once is described. A recursive formula is derived for defining the i-th mask that measures the theoretical allowance H sub - 1 to within the random errors of the process. The use of the proposed method in polishing an Era-18 convex aspherical lens is described. The results confirm the possbility of using the mask method to produce aspherical optical parts on commercially produced type ShP equipment.
Author

N86-15510# Joint Publications Research Service, Arlington, Va.
VENUS-15, VENUS-16 SYNTHETIC APERTURE RADAR ON VENUS SATELLITE ORBIT Abstract Only **c91**
A. F. Bogomolov, N. V. Zherikhin, and G. A. Sokholov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 71 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radiofizika (Gorkiy, USSR), v. 28, no. 3, Mar. 1985 p 259-274 Original language document was announced in IAA as A85-34876 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

The principles of the radar survey of the Venus surface made by the Venus-15 and Venus-16 missions are described. Basic technical data for the Polyus-V2 synthetic aperture radar on board the Venus-15 and Venus-16 are given in a table. A photograph is shown of the instrumental container with the antenna system mounted on it. The construction is described of the radar displays and the means and order of data processing by the ground-based stations are discussed. Radar pictures of the Venus surface and altitude profiles are shown. Information was obtained on approximately 115 million km2 of the Northern Hemisphere of Venus and surface images of almost optical quality make it possible to begin mapping of the planet. Author

N86-15511# Joint Publications Research Service, Arlington, Va.
ABSOLUTE MEASUREMENTS OF ANTENNA PARAMETERS BY ILLUMINATION METHOD Abstract Only **c32**
S. A. Pelyushenko *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 71-72 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radiofizika (Gorkiy, USSR), v. 28, no. 3, Mar. 1985 p 275-282 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

A new method for absolute calibration of antenna gain is described which uses a metal disk located in the far field of the antenna, which reflects the wideband noise signal radiated by the antennas as the calibrated transmitter. A block diagram is shown of the radiometer and the antenna feeder sections. The results of measurements of the effective area of the RTN-7 radio telescope at lambda = 95 cm agree well with data from the simultaneous calibration of the RTN-7 by the black disk method. Graphs are presented of the dependence of the signal-to-noise ratio on the magnitude of the signal illumination during matching of the feed. A diagram is shown of the directivity of the RTN-7 radio telescope in an azimuthal plane. The new method can also be used to measure the radiating power of antennas. Author

N86-15512# Joint Publications Research Service, Arlington, Va.
TIME CHARACTERISTICS OF SCATTERING BY RADAR TARGETS Abstract Only **c32**
V. I. Kirmasov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 73-74 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 3, Mar. 1985 p 16-19 Original language document was announced in IAA as A85-34170 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

A simple method for calculating the temporal scattering characteristics of radar targets is proposed which involves the calculation of the ramp function in the framwork of the physical-optics approximation. The proposed method can be used to compile a catalog of target profile functions with the aim of target indentification. In addition, the computed profile functions can be used as input data for simulating algorithms for the reconstruction of three-dimensional images of targets (e.g., tomography-based algorithms), Numerical results are compared with experimental data for the 1.08 to 10.8 GHz range. B.J.

N86-15513# Joint Publications Research Service, Arlington, Va.
EFFECTIVENESS OF PHASE-CONJUGATION SYSTEMS IN TURBULENT ATMOSPHERE Abstract Only **c32**
A. V. Polovinkin and A. I. Saichev *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 78 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 30, no. 3, Mar. 1985 p 463-469 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

The performance of phase conjugation adaptive systems for ranging and probing is analyzed, taking into account turbulence of the real atmosphere. Specifically, a system is considered which reverses only the front of the incident wave, and builds up the reflected wave to an amplitude not dependent on that of the incident wave. The mean field intensity and the mean energy of reflected waves are calculated in the Gaussian approximation, with an attendant evaluation of their statistical characteristics, assuming that a spherical wave from a point source is reflected by such a phase conjugation system at a given distance L away and that the amplitude of the reflected wave is known. General relations are established and applied to reflectors with small aperture and correspondingly strong diffraction, to reflectors with apertures within the intermediate range, and to reflectors with large apertures with compensation and strong refraction. In both large and small apertures the mean intensity is equal to the intensity at the center, owing to the particular mechanism operating in each case. Author

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N86-15514 Missouri Univ., Rolla.
A NEW APPROACH TO SIGNAL REGISTRATION WITH THE EMPHASIS ON VARIABLE TIME DELAY ESTIMATION Ph.D. Thesis
Mohamad Namazi 1985 203 p
Avail: Univ. Microfilms Order No. DA8516295

The problem of Signal Registration is viewed as a problem in nonlinear estimation. A received waveform r(t) is the sum of a nonlinearly modulated signal s(t,a(t)) and white Gaussian noise n(t) (power spectrum height No/2). The modulating signal a(t) is zero mean and has a known covariance function Ka(t,z). New algorithms are developed to estimate a(t) from r(t) = s(t, a(t)) + n(t). Special consideration is given to the problem of estimating a time-varying time delay. The performance of the estimation algorithm is studied both analytically and by simulation and compared to previously known techniques. Author

N86-15515 British Broadcasting Corp., Kingswood (England). Engineering Div.
DIGITAL TELEVISION ROUTING SYSTEMS: AN INTRODUCTION TO INTEGRATED OPTICAL WAVEGUIDE TECHNIQUES AND DEVICES
J. P. Willson Aug. 1985 29 p refs
(BBC-RD-1985/9) Avail: BBC, Kingswood Warren, Tadsworth, Surrey, Engl.

The development of a digital standard for the coding of component video signals has raised the problem of the appropriate technology to be used for the routing and distribution of such signals within a television studio center. Optical fibers offer a numberr of advantages over coaxial cable, such as high bandwidth, low loss, and small size. However, a major problem with optical transmission is that of routing the optical signals. One possible solution is to use integrated optical switches. The application of such devices for fabricating a large (100 x 100) array suitable for an all-digital BBC Television Centre is considered. The conclusion is that there remains a great deal of development to be done before such an array is feasible. Author

N86-15516 University Coll. of North Staffordshire, Keele (England). Dept. of Communications and Neuroscience.
PROSODIC ANALYSIS BY RULE Final Report
D. Lindsay Feb. 1985 24 p refs Sponsored by Joint Speech Research Unit, Cheltenham, UK
(Contract F7T/50377/C)
(BR94770) Avail: NTIS HC A02/MF A01

Research on the automatic computer analysis of intonation using linguistic knowledge is described. The use of computer programs to analyze and classify fundamental frequency (FO) contours, and work on the psychophysics of British English intonation and on the phonetics of FO contours are described. Results suggest that FO can be conveniently tracked to represent intonation through time, which can be subsequently used by a computer program as the basis for analysis. Nuclear intonation, where the intonational nucleus is the region of auditory prominence, or information focus, found in all spoken sentences was studied. The main mechanism behind such prominence is the perception of an extensive FO movement on the nuclear syllable. A classification of the nuclear contour shape is a classification of the sentence type, often into categories that cannot be readily determined from only the segmental phonemes of the utterance. Author (ESA)

N86-15517# Sandia National Labs., Albuquerque, N. Mex. Simulation Theory Div.
FINITE-DIFFERENCE ELECTRODYNAMIC ANALYSIS OF A TAPERING COAXIAL WAVEGUIDE INCORPORATING A

DIELECTRIC WEDGE-SHAPED LENS FOR CONCENTRATING TRANSVERSE ELECTROMAGNETIC (TEM) WAVES

Charles N. Vittitoe and Robert E. Clark (Mission Research Corp., Albuquerque, N. Mex.) Dec. 1984 25 p refs
(SAND-84-2062) Avail: NTIS HC A02/MF A01

The three-dimensional, finite-difference, electrodynamic computer code SOS models a portion of a coaxial, azimuthally symmetric tapering waveguide. A transverse electromagnetic (TEM) wave is launched at the inlet section in an oil medium. The wave is reflected from a Lucite section, from a wedge-shaped water dielectric, from a vacuum section, and from the tapering conductors. The edge is a lens that aids concentrating the energy into the tapering section. Voltage and current traces are examined at several locations within the waveguide. They determine the 40 pF wedge capacitance that increases the pulse risetime from the input 0.5 ns to < 1.5 ns at the outlet. Alterations are discussed to include more effects within the waveguide, to reduce the outlet-signal risetime, and to reduce the probability of arcing. Appendixes describe a dielectric thin-wedge subgrid model and a treatment for dielectric-interface boundary conditions that were developed and implemented into SOS so the code would be applicable.
Author

N86-15518# Systems Control, Inc., West Palm Beach, Fla.
VHF-AM COMMUNICATIONS EQUIPMENT SELECTION AND INSTALLATION PRACTICES FOR HELICOPTERS Final Report, Sep. 1983 - Mar. 1984

E. H. Bolz and L. D. King Sep. 1985 46 p refs
(Contract DTFA01-80-C-10080)
(DOT/FAA/PM-85/8) Avail: NTIS HC A03/MF A01

The problems helicopter operators face when using VHF communications within typical operating environments where coverage by the network of ground stations may be deficient are addressed. This is of particular interest to IFR helicopter operators. The specific reasons why communications effectiveness can be limited in mountainous or remote regions, considering typical low helicopter operating altitudes, are reviewed. Recommendations to operators for improving the airborne VHF installation, and therefore improving its coverage capabilities, are presented. Several installation-related factors are discussed. These include the characteristics of the hardware, i.e., the transceiver and the antenna, and the characteristics of the installation, including antenna installation and resulting coverage pattern, the cable run, the effects of signal availability and ways of maximizing the capture of the available signal. A set of procedures is presented which allows operators to evaluate numerically the benefit in terms of signal strength or sensitivity they may expect given that they make specific improvements to a given actual or planned installation.
Author

N86-15519# Pacific-Sierra Research Corp., Los Angeles, Calif.
EXPERIMENTS IN LONG-WAVELENGTH COMMUNICATION USING MODULATED ELECTRON BEAM ANTENNAS: A PARAMETER STUDY Final Report, 15 Jun. 1984 - 13 Jan. 1985

L. E. Johnson Aug. 1985 137 p
(Contract DNA001-84-C-0288; AF Proj. 2305)
(AD-A157810; PSR-1513; RADC-TR-85-133) Avail: NTIS HC A07/MF A01 CSCL 20/7

This preliminary study scopes the feasibility of producing electromagnetic signals from modulated beam antennas in the ionosphere and detecting those signals on the ground. Restricted to frequencies between tens of hertz and a megahertz, the report is essentially a handbook that gives predicted characteristics of the radiation produced by modulated electron beams employed in four different experiments. THe first is hypothetical and is optimized for the generation of detection of long-wavelength radiation. The other three are BERT-I, SEPAC, and VCAP. GRA

N86-15520# Pennsylvania Univ., Philadelphia.
RESEARCH IN ADAPTIVE BEAMFORMING FOR SATELLITE COMMUNICATIONS Final Technical Report, Apr. 1983 - Oct. 1984

F. Haber, Y. Bar-Ness, C. C. Yeh, S. U. Pillai, and T. H. Chao May 1985 186 p
(Contract F30602-83-K-0046)
(AD-A157828; UP-VFRC-26-84; RADC-TR-85-96) Avail: NTIS HC A09/MF A01 CSCL 17/2

The results of a study on adaptive beam forming and interference cancelling pertinent to communication satellites are herein reported. The study was an extension of an earlier effort aimed at overcoming the effects of uncertainty in the formation of a pointing vector. That work led to the Hybrid Array which utilized prior information on signal direction and structure. The work herein described deals with: (1) improvements and alternatives to existing schemes of reducing sensitivity to pointing error; and (2) extensions to wideband schemes which are not overly sensitive to pointing error; and (3) methods to aid in the accurate determination of the pointing vector. GRA

N86-15521# Naval Postgraduate School, Monterey, Calif.
AN EXAMINATION OF SOME ERROR CORRECTING TECHNIQUES FOR CONTINUOUS SPEECH RECOGNITION TECHNOLOGY

G. K. Poock and B. J. Martin Jun. 1985 37 p
(AD-A158001; NPS55-85-012) Avail: NTIS HC A03/MF A01 CSCL 17/2

The primary purpose of this research was to examine the effects of various input string lengths and error correction methods on the recognition accuracy and efficiency of a currently available continuous automatic speech recognition (ASR) system. The effect of sex was examined also and an estimate of the average recognition accuracy of a continuous ASR system was sought. In the entry of numerical data, the input string length of seven digits at a time proved significantly more efficient than strings of three or five. Although subjects preferred some error correction methods over others, there were no significant differences in error rates or efficiency due to the correction method used. There were also no significant differences due to sex. The average recognition accuracy of the continuous ASR system was conservatively estimated at over 95%. GRA

N86-15522# Royal Military Coll. of Science, Shrivenham (England).
INVESTIGATIONS AND COMPARISONS OF NEW TYPES OF MILLIMETRE-WAVE PLANAR ARRAYS USING MICROSTRIP AND DIELECTRIC STRUCTURES Final Technical Report, Aug. 1983 - Apr. 1985

J. R. James and C. M. Hall Apr. 1985 118 p
(Contract DAJA45-83-C-0054; DA Proj. 1T1-61102-BH-57)
(AD-A158313) Avail: NTIS HC A06/MF A01 CSCL 09/1

The combination of microstrip and dielectric structures has been found to offer possibilities for improvements upon purely microstrip planar antennas which are limited particularly at millimeter wavelengths by dissipative losses and by radiation from complex feed networks. All the structures considered retain microstrip radiating elements and in the first case a dielectric feed line was used in a travelling-wave array which enabled feeder losses to be reduced. However field compatibility problems with all-dielectric feeder networks caused excessive radiation losses. The same compatibility problems with conventional rectangular waveguide prevent the full potential of this array from being realized but is still preferable to all-dielectric feeder networks. The retention of microstrip feed networks allows much improved integration possibilities and this was realized by combining a microstrip patch with an overlaid dielectric sphere. When combined in the form of parallel connected arrays with a sparse feed network the result is much lower levels of corrupting radiation than have previously been achieved and the provision of space within the aperture for electronic components such as phase shifters. GRA

N86-15523# Naval Research Lab., Washington, D. C.
NAVAL SPACE SURVEILLANCE MODERNIZED RECEIVER SYSTEM. VOLUME 6: DATA COMMUNICATIONS SUBSYSTEM Interim Report, 1979 - 1984

C. H. Weaver 14 Aug. 1985 17 p
(AD-A158465; NRL-8910-Vol-6) Avail: NTIS HC A02/MF A01

CSCL 17/2

The Naval Space Surveillance System was developed by the Naval Research Laboratory (NRL) during the period 1958 to 1964. This system was necessary to satisfy the needs of the U. S. Government's desire to detect nonradiating space objects passing over the continental United States (CONUS). This system has been operational since 1960 and is the only Navy system contributing to the Space Detection and Tracking System operated by the Space Defense Center, North American Aerospace Defense Command. This system, with no prior information, detects all objects in Earth's orbit passing over CONUS and computes the orbital elements of these objects. This report describes the design of the data communications system that was developed as part of the modernization program for improving the performance of the original Naval Space Surveillance Receiver Systems. Salient aspects of the design include increased data throughput, failure-recovery transmission modes, and message formatting characterization to satisfy the special requirements for system operation at Naval Space Surveillance Headquarters. The design also emphasized an abundant margin of data space for the control and text fields that were nearly exhausted at the completion of the developmental tests. GRA

N86-15524# Naval Postgraduate School, Monterey, Calif.
DETECTION OF PERIODIC SIGNAL OF ARBITRARY SHAPE WITH RANDOM TIME DELAY M.S. Thesis
K. A. Ansari Jun. 1985 113 p
(AD-A158979) Avail: NTIS HC A06/MF A01 CSCL 09/4

The detection of periodic signals of arbitrary wave shape with random time delay in additive white Gaussian noise, is a problem of practical significance in radar and communication applications. In this thesis, the analysis and design of optimum and suboptimum receivers for detecting signals as described above has been carried out. The design of optimum (in minimum probability of error, Pe sense) receivers is based on the likelihood ratio test under the assumption of low SNR conditions. The design of suboptimum receivers is based on the heuristic approaches that intuitively yield reasonably good performance. Examples have been analyzed in order to present numerical results in graphical form on the performance of the receivers under different assumptions of wave ships and p.d.f. on the random time delay associated with the signal. Author (GRA)

N86-15525# Mitre Corp., Bedford, Mass.
EFFECT OF ANTENNA IMPEDANCE MISMATCH ON THE SIGNAL-TO-NOISE RATIO OF A RADIO RECEIVING SYSTEM Final Report
M. M. Weiner Jul. 1985 170 p
(Contract F19628-84-C-0001)
(AD-A159070; MTR-9221; ESD-TR-85-136) Avail: NTIS HC A08/MF A01 CSCL 17/2

The noise factor of linear two-port networks are derived for several networks of interest, including those of a passive transmission line and of an active receiver, whose source impedance may be mismatched to the characteristic impedance of the line. It is shown that a large impedance mismatch at the antenna-transmission line interface of a radio receiving system can cause a significant increase in the system internal noise factor (more than a 50 dB increase for a voltage reflection coefficient of 09999). Numerical results are presented for a VHF-FM radio receiving system with an electrically-short monopole antenna. In the absence of a matching network, the limiting noise of the system is generated within the system (by the transmission line and receiver) and can be more than 20 dB larger than the external man-made noise. With a matching network, the limiting noise of the system is external man-made noise. GRA

N86-15526# Stanford Univ., Calif. Dept. of Computer Science.
HOST GROUPS: A MULTICAST EXTENSION FOR DATAGRAM INTERNETWORKS
D. R. Cheriton and S. E. Deering Jul. 1985 11 p
(Contract N00039-83-K-0431)
(AD-A159146; SU-STAN-CS-85-1058; SU-CSL-85-280) Avail: NTIS HC A02/MF A01 CSCL 17/2

The extensive use of local networks is beginning to drive requirements for internetwork facilities that connect these local networks. In particular, the availability of multicast addressing in many local networks and its use by sophisticated distributed applications motivates providing multicast across internetworks. This paper proposes a model of service for multicast in an internetwork, describe how this service can be used, and describe aspects of its implementation including how it would fit into one existing internetwork architecture, namely the US DOD internet Architecture. Author (GRA)

N86-15527# Naval Postgraduate School, Monterey, Calif.
A VARIANCE DETECTOR FOR SIGNAL-GAP DISCRIMINATION IN NOISY SPEECH CHANNELS Technical Report, Aug. - Sep 1984
J. L. Wayman May 1985 22 p
(AD-A159227; NPS53-85-0007) Avail: NTIS HC A02/MF A01 CSCL 17/2

This report documents a program written for post- (FFT) processor activity/gap detection in noisy speech communication channels. The algorithm used is based on the assumption that the variance of the logs of the frequency-domain magnitudes of a signal is greater than the corresponding variance of the channel noise. Trade-offs between Type 1 and Type 2 errors can be controlled with and interactively defined program parameters. Parameters were found to yield a 16% missed detection rate with a 5% false alarm rate, performance entirely acceptable in speech compression applications. Some problems were encountered with sibilate detection, due to the close relationship between these sounds and white noise. Author (GRA)

N86-15528# Air Force Academy, Colo.
NUMBER OF TARGETS THREATENED SIMULTANEOUSLY (NOTTS) IN CONJUNCTION WITH OVER THE HORIZON BACK-SCATTER (OTHB) RADAR COVERAGE Final Report, Jan. 1984 - Dec. 1985
J. F. Sheedy Aug. 1985 74 p
(AD-A159304; AD-F250300; USAFA-TR-85-9) Avail: NTIS HC A04/MF A01 CSCL 17/9

Number of Targets Threatened Simultaneously (NOTTS) is a measure of the presence (in a background of unknowns) of a surprise attack on the U.S. retaliatory force. Four NOTTS indicators PEAK, KURTOSIS, RIDGE, and P1, P2, and P3 are defined and evaluated using the J5YA Raid Recognition Algorithm for a bomber or cruise missile raid against SAC and C3 target sets. Scatter charts showing background noise produced by commercial traffic, raid plus noise combined are presented and used to describe the setting of reaction thresholds. The effect of time of day, probability of radar detection, and the choice of target set and raid design on reaction threshold are discussed. Although ideal settings of indicators are practical in the cases discussed, attention is drawn to the limited data available for modeling of unknowns in OTHB coverage. GRA

N86-15529# Massachusetts Univ., Amherst. Dept. of Mathematics and Statistics.
MATHEMATICAL PROBLEMS IN STABILITY, CONTROL AND RELIABILITY OF RANDOM ACCESS COMMUNICATION SYSTEMS Annual Report, 15 May 1984 - 14 May 1985
W. A. Rosenkrantz 11 Jun. 1985 3 p
(Grant AF-AFOSR-0167-82)
(AD-A159402; AFOSR-85-0715TR; AR-11) Avail: NTIS HC A02/MF A01 CSCL 17/2

Current research is focused on three problems: (1) stability analysis of the exponential back-off protocol; (2) a diffusion approximation for the steady state distribution of the slotted ALOHA protocol; and (3) a Poisson limit theorem for a load balancing protocol. Work began on applying Stochastic Catastrophe Theory to the study of the exponential back-off protocol when there are a finite number of users. Work is also planned on a theoretical analysis of the diffusion approximation to the slotted ALOHA protocol. (Author). GRA

N86-15530# Environmental Research Inst. of Michigan, Ann Arbor. Radar Div.
SAR (SYNTHETIC APERTURE RADAR) DATA COLLECTION AND PROCESSING SUMMARY - 1984 SARSEX (SAR INTERNAL WAVE SIGNATURE EXPERIMENT) EXPERIMENT Topic Report, May 1984 - Feb. 1985
E. S. Kasischke, R. A. Shuchman, R. W. Larson, D. R. Lyzenga, and J. C. Clinthorne Mar. 1985 149 p
(Contract N00014-81-C-0692)
(AD-A159440; ERIM-155900-21-T) Avail: NTIS HC A07/MF A01 CSCL 17/9

This report describes the SAR data collection and processing activities performed to date for the SAR Internal Wave Signature Experiment (SARSEX). During SARSEX, a total of 88 passes of X- and L-band SAR data were collected over two test areas by the ERIM/CCRS CV-580 SAR System. These data were collected over an instrumented ocean site located 100 km south of Long Island, NY and a calibrated reflector array site. A description of the CV-580 SAR System is presented. The location of each SAR pass, along with a listing of the SAR and aircraft parameters, are given. All SAR data have been precision optically processed and reviewed. A selected subset of data have been digitally processed and a preliminary engineering assessment of the quality of the SAR imagery performed. The results of this assessment are presented, as are representative examples of optically-and digitally-processed SAR imagery collected during SARSEX. Finally, the analysis plans for the SAR data are discussed, including a presentation of the procedures to calibrate the SAR imagery. GRA

N86-15531# Naval Postgraduate School, Monterey, Calif.
INTEGRATED SERVICES DIGITAL NETWORK (ISDN) M.S. Thesis
M. T. Weidert Jun. 1985 70 p
(AD-A159578) Avail: NTIS HC A04/MF A01 CSCL 09/2

This thesis contains development of a conceptual framework for an Integrated Services Digital Network (ISDN) and relates ISDN concepts to non-tactical Department of Defense (DOD) communications applications. The conceptual framework developed is non-technical and is intended to provide general management with an introduction to the ISDN. An existing model communications system, Japan's Information Network System (INS), which exhibits characteristics of ISDN, is also discussed in terms of the conceptual framework developed. General ISDN concepts are also related to DoD applications. The Defense Data Network (DDN) is presented as a candidate network on which a potential military ISDN could be based. GRA

N86-15532# Department of the Air Force, Washington, D.C.
WAVELENGTH SELECTIVE DEMULTIPLEXER TUNER Patent Application
C. R. Husbands, inventor (to Air Force) Filed 25 Oct. 1983 15 p
(AD-D011890; US-Patent-Appl-SN-545307) Avail: NTIS HC A02/MF A01 CSCL 17/2

A wavelength selective demultiplexer tuner having an optically transmissive body for receiving an input signal containing a plurality of different wavelengths and transmitting the signal therethrough is presented. An electro-optic block of material is secured to the body of the tuner and a reflective grating or mirror is secured to the electro-optic block of material for redirecting through the body the input signal as a plurality of signals, each containing a different one of the wavelengths. By appropriately varying a voltage placed across the electro-optic block of material, the index of refraction of the block of material changes thereby altering the optical paths followed by the plurality of signals redirected through the body. In this manner, each of the signals containing a different one of the wavelengths can be selectively output from the body at different times and at the same, single location. Author (GRA)

N86-15533# Rome Univ. (Italy). Dipt. di Fisica.
CORRELATIONS BETWEEN SIGNALS FROM GRAVITATIONAL WAVE ANTENNAS IN ROME AND IN GENEVA
E. Amaldi, P. Bonifazi, E. Coccia, S. Frasca, R. Habel, I. Modena, G. V. Pallottino, G. Pizzella, P. Rapagnani, F. Ricci et al 22 May 1985 35 p refs Submitted for publication Prepared in cooperation with CNR, Frascati, Italy; CNR, Rome and European Nuclear Energy Agency, Frascati, Italy
(Preprint-462) Avail: NTIS HC A03/MF A01

Signals from a gravitational wave antenna in Rome at room temperature were compared with a 4.2 K antenna in Geneva. Since the Rome antenna was not fully ready at the time of the coincidence analysis more data are required, with both antennas in full operation, before conclusions can be reached. Author (ESA)

N86-15534# Helsinki Univ. (Finland). Radio Lab.
[ACTIVITIES REPORT OF THE RADIO LABORATORY] Annual Report, 1983
Martti Hallikainen, ed. 1984 28 p refs
(Rept-S-160; ISBN-951-753-305-5; ISSN-0355-5712) Avail: NTIS HC A03/MF A01

Electromagnetic research; microwave applications to remote sensing and industrial and medical studies; radio science instrumentation; microwave and millimeter wave propagation; radio astronomy; circuit theory; and computer aided design are discussed.
Author (ESA)

N86-15535# Helsinki Univ. (Finland). Radio Lab.
EXACT IMAGE METHOD FOR IMPEDANCE COMPUTATION OF ANTENNAS ABOVE THE GROUND
Ismo V. Lindell, Esko Alanen, and Kari Mannersalo 1984 23 p refs Sponsored by Academy of Finland
(Rept-S-161; ISBN-951-753-395-0; ISSN-0355-5712) Avail: NTIS HC A02/MF A01

A principle of exact image developed for the Sommerfeld problem is applied to the classical impedance problem of antennas above the ground. The effect of the ground is taken into account with an image source located in complex space, leading to a modified Green function for the antenna current integral equation. The image of the antenna can be determined through expressions evaluated for the image current function. The stationary functional for the antenna impedance is extended to take into account the effect of the ground. Impedance expressions for small dipoles and half-wave dipoles are calculated and compared with previous results. Methods for calculating the impedance of wire antennas with finite thickness from that of infinitesimally thin antennas, and to determine ground parameters from horizontal dipole minimum resistance and height measurements are presented. Author (ESA)

N86-15536# Research Inst. of National Defence, Stockholm (Sweden). Dept. 5.
VISIBILITY OF NOISE IN HOMOGENEOUS AND TEXTURED AREAS
Hans Marmolin and Anders Carlstroem May 1985 23 p refs
(FOA-C-50010-H2; ISSN-0347-7665) Avail: NTIS HC A02/MF A01

A study to find a measure of noise in good accord with its visibility was conducted. The effect of average luminance level on noise visibility and the effect of gradual and stepwise luminance changes were studied. Results indicate that noise visibility is strongly affected by average luminance level while the effects of luminance changes are weak. As a first approximation it is recommended to use the ratio between noise RMS and average luminance as an index of noise visibility and to compute noise visibility in textured areas by averaging noise-luminance ratios.
Author (ESA)

N86-15537# Physics and Electronics Lab. TNO, The Hague (Netherlands).
THE DESIGN OF A ROTMAN LENS
H. J. Exalto and H. R. vanEs Feb. 1985 54 p refs In DUTCH; ENGLISH summary
(Contract L77/Alg/115)
(FEL-1985-13; TDCK-93256) Avail: NTIS HC A04/MF A01

A Rotman parallel-plate-lens with a linear array antenna preceeded by a multibeam forming network to excite several orthogonal beams simultaneously, is described. This lens type is

chosen for its relatively few phase errors. The lens principle is based upon electrical path length differences between input and output-ports, the beam direction being frequency independent. The design is executed in microstrip with a 10.5 substrate permittivity, using computer facilities to fix contours and ports accurately. The design is meant for the 8 to 12 GHz frequency-band. Measurements show good agreement with the theory, although standing wave ratios of the input-ports are still too high. The antenna is developed for electronic countermeasures. Author (ESA)

N86-15538# Physics and Electronics Lab. TNO, The Hague (Netherlands). Research Group 3.
PROGRAMS TO COMPUTE THE CIRCULAR ERROR PROBABILITY (CEP) OF A LOCATION SYSTEM WITH DIRECTION FINDING STATIONS
R. Middelkoop Mar. 1985 58 p refs In DUTCH; ENGLISH summary
(Contract A81/KL/134)
(FEL-1985-20; TDCK-93154) Avail: NTIS HC A04/MF A01

Three programs to compute circular error probabilities (CEP) for a radio direction finder location system, a general program with no propagation effects, a program for VHF propagation, and one for HF groundwave, are described. They form the tools for research into the influence of parameters such as bearing base, number and disposition of the stations, spread spectrum modulation, and bearing mistakes caused by instruments and surroundings. Supposing that the bearings are independent and normally distributed, the CEP is calculated from an ellipse drawn from crossbearing two or more stations. The CEP is computed for maximum arrangement of 10 stations and for low signal to noise ratio. Comparing the results with literature data, the programs show good agreement. Author (ESA)

N86-15539# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abt. Hochfrequenzphysik.
INVESTIGATIONS OF THE INTERFERENCE SCATTERING AND METHODS FOR ITS SUPPRESSION IN NEAR-GROUND RADAR BACKSCATTERING MEASUREMENTS
Karl-Heinz Bethke Jun. 1985 66 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-967)
(DFVLR-FB-85-42; ISSN-0171-1342) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 22

Electromagnetic wave scattering in near-ground measurements was studied with examples of ground reflection and wedge diffraction to reach high dynamic ranges for field strength measurements with a controlled suppression of the scattering signals in near-ground level. The effects of the ground reflection on the intensity distribution of the electric field strength were studied. Experimental results at 10 GHz under real conditions were compared with theory. The suppression of the ground reflected signals with screening fences is described. Electromagnetic wave diffraction was investigated using the Fresnel diffraction theory. The diffraction on a slit screen was studied to obtain a dimensioning method for optimal strip grid construction as well as the diffraction on a large slot. Computerized simulation results are confirmed on simple grid structures and the limits of application of the Fresnel diffraction theory are determined. Author (ESA)

N86-15540# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Apparate.
BROADBAND SIMULATION OF MULTIPATH PROPAGATION IN VHF MOBILE RADIO Thesis - Univ. der Bunderwehr, Munich, West Germany [BREITBANDIGE SIMULATION DER MEHRWEGEAUSBREITUNG IM VHF-MOBILFUNK]
Karl H. Niederhofer 31 May 1985 130 p refs In GERMAN
(MBB-UA-905/85) Avail: NTIS HC A07/MF A01

A broadband simulator which allows the reproduction of the essential characteristics of mobile radio communication was designed and built. The statistics of multipath propagation, and modulation perturbations due to multipath propagation are discussed. Simulator and control concepts for VHF multipath mobile radio are presented. The technical realization of the simulation of the reflected signals and vehicle motions was performed by variable retardation modules. The parameters can be changed with a calculator or manually. Control programs were developed for real time simulation. The simulator processes signals between 50 and 70 MHz. The dynamic range is 30 dB. The input signal can be shifted by 1.7 microsec for a 5 Mhz bandwidth. The simulator allows a broadband reproduction of multipath propagation. Author (ESA)

N86-15453# Joint Publications Research Service, Arlington, Va.
MILLIMETRIC-WAVE ANTENNAS AND DEVICES: REVIEW Abstract Only
D. I. Voskresenskiy, V. M. Maksimov, S. V. Rud, and I. G. Sukharev *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 35 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radioelektronika (Kiev, USSR), v. 28, no. 2, Feb. 1985 p 4-23 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

N86-15454# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF LOG-PERIODIC ANTENNAS WITH PRESCRIBED GEOMETRY Abstract Only
V. A. Yatskevich *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 37 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radioelektronika (Kiev, USSR), v. 28, no. 2, Feb. 1985 p 40-45 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

N86-15455# Joint Publications Research Service, Arlington, Va.
BOUNDARY WAVES IN FINITE ANTENNA ARRAYS Abstract Only
V. S. Filippov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 39-40 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radioelektronika (Kiev, USSR), v. 28, no. 2, Feb. 1985 p 61-67 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

N86-15456# Joint Publications Research Service, Arlington, Va.
SCATTERING BY CYLINDER WITH ANISOTROPIC IMPEDANCE Abstract Only
A. V. Klimov, B. M. Petrov, and A. I. Semenikhin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 40 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radioelektronika (Kiev, USSR), v. 28, no. 2, Feb. 1985 p 74-78 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

N86-15457# Joint Publications Research Service, Arlington, Va.
MATRIX ANALYSIS OF PERIODIC INTERLEAVED MULTIFREQUENCY ANTENNA ARRAYS Abstract Only
L. I. Ponomarev *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 41 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radioelektronika (Kiev, USSR), v. 28, no. 2, Feb. 1985 p 79-86 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

N86-15458# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF MULTIMODE WAVEGUIDE-TYPE POWER DISTRIBUTOR Abstract Only
Yu. V. Likhoded and L. I. Ponomarev *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 41-42 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radioelektronika (Kiev, USSR), v. 28 no. 2, Feb. 1985 p 74-78 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

N86-15459# Joint Publications Research Service, Arlington, Va.
EXCITATION OF ARRAY OF PLANE-PARALLEL WAVEGUIDES COVERED WITH DIELECTRIC LAYER OF FINITE LENGTH Abstract Only
B. D. Manuilov and V. M. Shablovskiy *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 43 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radioelektronika (Kiev, USSR), v. 28, no. 2, Feb. 1985 p 96-99 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

N86-15460# Joint Publications Research Service, Arlington, Va.
USE OF ACTIVE QUENCHING FOR REDUCTION OF POWER DISSIPATION IN DIPOLE ANTENNA ARRAY Abstract Only
L. I. Ponomarev, A. V. Dolgin, and A. V. Shatalov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 43 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radioelektronika (Kiev, USSR), v. 28 no. 2, Feb. 1985 p 99-100 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

N86-15461# Joint Publications Research Service, Arlington, Va.
SIGNAL AND INTERFERENCE LEVELS IN ANTENNA ARRAY WITH OPTIMUM RADIATION PATTERN Abstract Only
A. S. Popov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 44 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radioelektronika (Kiev, USSR), v. 28, no. 2, Feb. 1985 p 103-104 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

N86-15462# Joint Publications Research Service, Arlington, Va.
EFFECT OF CORNER REFLECTOR ON FIELD OF LINEAR RADIATOR Abstract Only
Yu. V. Pimenov and A. K. Salakh *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 44 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 2, Feb. 1985 p 83-84 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

N86-15463# Joint Publications Research Service, Arlington, Va.
LONGITUDINALLY SLOTTED CYLINDRICAL SHIELD WITH FINITE THICKNESS AND ELECTRICAL CONDUCTANCE Abstract Only
R. M. Dzhala *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 45 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 30, no. 1, Jan. 1985 p 1-7 Previously announced in IAA as A85-23551 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

N86-15464# Joint Publications Research Service, Arlington, Va.
RADIATION PATTERN AND REDUCED GAIN OF LINEAR ANTENNA IN TURBULENT ANISOTROPIC ATMOSPHERE Abstract Only
N. A. Armand, I. N. Kibardina, and A. N. Lomakin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 45 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 30, no. 1, Jan. 1985 p 8-14 Previously announced in IAA as A85-23552 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

N86-15465# Joint Publications Research Service, Arlington, Va.
MULTILAYER VOLUME MICROWAVE FILTERS Abstract Only
V. I. Gvozdev, S. V. Smirnov, and A. M. Chernushenko *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 59 Transl. into ENGLISH from Elektrosvyaz (Moscow, USSR), no. 2, Feb. 1985 p 47-48 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

N86-15470# Joint Publications Research Service, Arlington, Va.
PROCEDURE FOR CALCULATING ATTENUATION IN AND RELIABILITY OF ATMOSPHERIC OPTICAL DATA TRANSMISSION SYSTEMS Abstract Only
Ye. R. Milyutin and Yu. I. Yaremenko *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 91 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 2, Feb. 1985 p 11-18 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

N86-15471# Joint Publications Research Service, Arlington, Va.
SELECTION OF SIGNALS FOR DIGITAL OPTICAL CHANNEL Abstract Only
S. Ye. Fedorov and A. N. Martyanov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 91-92 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 30, no. 1, Jan. 1985 p 139-147 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

N86-15472# Joint Publications Research Service, Arlington, Va.
EFFICIENCY OF COHERENT RECEPTION OF OPTICAL SIGNAL PROPAGATING THROUGH TURBULENT ATMOSPHERE Abstract Only
V. A. Bureyev, V. Ye. Kirakosyants, and V. A. Loginov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 93 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 30, no. 1, Jan. 1985 p 90-93 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

N86-15494# Joint Publications Research Service, Arlington, Va.
MAIN TRENDS IN SATELLITE COMMUNICATION AND BROADCASTING RESEARCH Abstract Only
Yu. B. Zubarev and L. Ya. Kantor *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 16-17 Transl. into ENGLISH from Elektrosvyaz (Moscow, USSR), no. 5, May 1985 p 15-18 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15495# Joint Publications Research Service, Arlington, Va.
TRANSMISSION OF TELEVISION SIGNALS OVER OPTICAL COMMUNICATION CHANNEL BY MEANS OF FREQUENCY MODULATION Abstract Only
Yu. M. Kirik, M. I. Krivosheyev, Yu. I. Marimont, Yu. A. Kharitonova, A. I. Shlayn, and Ye. A. Shchervakov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 17 Transl. into ENGLISH from Elektrosvyaz (Moscow, USSR), no. 5, May 1985 p 28-30 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15500# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF UNIDIRECTIONAL FERRITE MICROSTRIP LINES Abstract Only
P. P. Bobrov, A. V. Gidlevskiy, and Yu. A. Kirsanov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 32 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 3, Mar. 1985 p 64-67 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15504# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF ELECTROMAGNETIC FORCES IN MAGNETIC FIELD CALCULATIONS Abstract Only
A. G. Nazaryan, A. L. Mailyan, and E. Kh. Adzhemyan *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 54-55 Transl. into ENGLISH from Elektrichestvo (Moscow, USSR), no. 4, Apr. 1985 p 58-60 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15511# Joint Publications Research Service, Arlington, Va.
ABSOLUTE MEASUREMENTS OF ANTENNA PARAMETERS BY ILLUMINATION METHOD Abstract Only
S. A. Pelyushenko *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 71-72 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radiofizika (Gorkiy, USSR), v. 28, no. 3, Mar. 1985 p 275-282 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15512# Joint Publications Research Service, Arlington, Va.
TIME CHARACTERISTICS OF SCATTERING BY RADAR TARGETS Abstract Only
V. I. Kirmasov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 73-74 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 3, Mar. 1985 p 16-19 Original language document was announced in IAA as A85-34170 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15513# Joint Publications Research Service, Arlington, Va.
EFFECTIVENESS OF PHASE-CONJUGATION SYSTEMS IN TURBULENT ATMOSPHERE Abstract Only
A. V. Polovinkin and A. I. Saichev *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 78 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 30, no. 3, Mar. 1985 p 463-469 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15562# Joint Publications Research Service, Arlington, Va.
SOLUTION TO REVERSE REFRACTION PROBLEM Abstract Only
A. G. Pavelyev *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 1 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 9, Sep. 1984 p 1658-1667 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15563# Joint Publications Research Service, Arlington, Va.
MAXIMUM ANTENNA POWER RECEPTION IN LOSSY MEDIUM Abstract Only
Ya. N. Feld *In its* USSR Report: Electronis and Electric Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 1-2 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 9, Sep. 1984 p 1668-1676 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15564# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF POINT SOURCE IMAGE FIELD STRUCTURE BY REAL RADIOOPTICAL ANTENNA Abstract Only
F. Kh. Baybulatov and M. I. Kudryashov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 2 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 9, Sep. 1984 p 1677-1683 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15565# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF MAGNETOSTATIC WAVE PROPAGATION THROUGH FILM WAVEGUIDES Abstract Only
G. M. Novikov and Ye. Z. Petrunkin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 3 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 9, Sep. 1984 p 1691-1695 Original language document was announced in IAA as A85-10431 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15566# Joint Publications Research Service, Arlington, Va.
STATISTICAL CHARACTERISTICS OF ULTRASHORT-WAVE SIGNAL FAST PHASE FLUCTUATIONS BASED ON AMPLITUDE MEASUREMENTS ON SEA LANES Abstract Only
B. S. Rybakov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 3-4 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 9, Sep. 1984 p 1720-1725 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15567# Joint Publications Research Service, Arlington, Va.
ESTIMATING NUMBER AND PARAMETERS OF SIGNAL COMPONENTS IN PRESENCE OF NOISE Abstract Only
A. A. Kuriksha *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 4-5 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 9, Sep. 1984 p 1740-1744 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15568# Joint Publications Research Service, Arlington, Va.
MODULAR FLOATING DECIMAL POINT OPERATIONS FOR ANTENNA ARRAY ADAPTATION Abstract Only
V. V. Kryuchkov, V. P. Leevshin, V. F. Strucheev, and A. G. Kharitonov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006-) 30 Apr. 1985 p 5 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 9, Sep. 1984 p 1754-1756 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15569# Joint Publications Research Service, Arlington, Va.
LOCAL IONOSPHERIC IRREGULARITY EFFECT ON ELF RADIOWAVE PROPAGATION Abstract Only
A. P. Nikolayenko *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 8 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radiofizika (Gorkiy, USSR), v. 27, no. 10, Oct. 1984 p 1227-1237 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15570# Joint Publications Research Service, Arlington, Va.
IONOSPHERE INFLUENCE ON MHD WAVE BUNDLE PROPAGATION Abstract Only
L. S. Alperovich and Ye. N. Fedorov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 8 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radiofizika (Gorkiy, USSR), no. 27, no. 10, Oct. 1984 p 1238-1247 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15571# Joint Publications Research Service, Arlington, Va.
CONTRIBUTION TO MULTILAYER SPHERICAL SCREEN THEORY Abstract Only
V. L. Avramenko and V. N. Krasilnikov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 10 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radiofizika (Gorkiy, USSR), v. 27, no. 10, Oct. 1984 p 1299-1305 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15572# Joint Publications Research Service, Arlington, Va.
ADIABATIC INVARIANT VALUE VARIATION UNDER SHORT-WAVE BAND SUBCRITICAL CONDITIONS Abstract Only
K. V. Svistunov and M. V. Tinin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 11 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radiofizika (Gorkiy, USSR), v. 27, no. 10, Oct. 1984 p 1340-1343 Original language document was announced in IAA as A85-17467 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15573# Joint Publications Research Service, Arlington, Va.
DEGRADATION OF SURFACE-ACOUSTIC-WAVE RESONATORS Abstract Only
M. A. KRevskiy, M. S. Sandler, and A. V. Yakimov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006)

30 Apr. 1985 p 12-13 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 11, Nov. 1984 p 2101-2104 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15574# Joint Publications Research Service, Arlington, Va.
EFFECT OF CYLINDRICAL RERADIATOR ON PARAMETERS OF ANTENNA AND ANTENNA ARRAY Abstract Only
B. M. Levin and S. S. Fomintsev *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 13 Transl. nto ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 11, Nov. 1984 p 2140-2147 Original language document was announced in IAA as A85-15684 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15575# Joint Publications Research Service, Arlington, Va.
BASIC CHARACTERISTICS OF RADAR ANTENNA WITH SYNTHESIZED APERTURE TRACKING ARBITRARY MOTION OF AIRCRAFT Abstract Only
Ya. S. Itskhoki, N. A. Sazonov, and Ye. F. Tolstov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 14 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 11, Nov. 1984 p 2164-2172 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15576# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF RADAR OBJECTS DETECTABLE BY SUPERWIDE-BAND SIGNALS Abstract Only
L. Yu. Astanin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 15-16 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 11, Nov. 1984 p 19-24 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15577# Joint Publications Research Service, Arlington, Va.
REFLECTION COEFFICIENT OF HARROW GRATING WITH CONDUCTOR STRIPS WITH RESPECT TO ELECTROMAGNETIC WAVES Abstract Only
V. I. Ponomarenko, D. I. Mirovitskiy, and I. F. Budagyan *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 16 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 11, Nov. 1984 p 68-71 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15578# Joint Publications Research Service, Arlington, Va.
MODULATION INSTABILITY AND SOLITONS OF ELECTROMAGNETIC WAVE ENVELOPES IN FERROMAGNETIC SEMICONDUCTORS Abstract Only
F. G. Bass and N. N. Masonov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 19 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy Radiofizika (Gorkiy, USSR), v. 27, no. 11, Nov. 1984 p 1460-1467 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15586# Joint Publications Research Service, Arlington, Va.
LOWER LIMIT OF ERROR PROBABILITY IN DISCRETE ADDITION OF BINARY SIGNALS FROM PARALLEL CHANNELS Abstract Only
Ye. D. Kononov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 35 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 11, Nov. 1984 p 57-59 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15611# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF HIGHER TYPES OF OSCILLATIONS ON PISTON-TUNED WAVEGUIDE GUNN OSCILLATOR FREQUENCY Abstract Only
A. A. Litsov, D. A. Usanov, B. P. Bezruchko, and A. Yu. Vagarin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 60 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow), v. 29, no. 10, Oct. 1984 p 2057-2058 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15612# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF ELLIPTICAL WAVEGUIDES IN CYLINDRICAL REFERENCE BASIS Abstract Only
G. I. Veselov and N. I. Platonov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 61 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 11, Nov. 1984 p 64-67 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15622# Joint Publications Research Service, Arlington, Va.
ACOUSTOOPTIC DEMODULATOR OF PHASE-KEYED SIGNALS Abstract Only
A. V. Pugovkin, V. A. Krakovskiy, and G. A. Kolchina *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 73-74 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 11, Nov. 1984 p 2266-2268 Original language document was announced in IAA as A85-15694 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N86-15541 Department of the Air Force, Washington, D.C.
SELF-GUARDING SCHOTTKY BARRIER INFRARED DETECTOR ARRAY Patent
F. D. Shepherd, Jr., P. W. Pellegrini, C. E. Ludington, and M. M. Weeks, inventors (to Air Force) Issued 23 Jul. 1985 6 p Supersedes AD-D010089
(AD-D011894; US-Patent-4,531,055; US-Patent-Appl-SN-455677; US-Patent-Class-250-211J) Avail: US Patent and Trademark Office CSCL 09/5

A two dimensional focal plane array of Schottky photodiodes on a silicon substrate for infrared imaging is presented. The array is designed for mating with multiplexing circuitry and has a self-guarding feature wherein adjacent Schottky electrodes act as guard electrodes. This feature allows a substantial increase of the focal plane area coverage ratio. Author (GRA)

N86-15542 Department of the Air Force, Washington, D.C.
BIPOLAR DIGITIZER HAVING COMPRESSION CAPABILITY Patent
J. E. Simpson, inventor (to Air Force) Issued 9 Jul. 1985 11 p Supersedes AD-D010139
(AD-D011895; US-Patent-4,528,549; US-Patent-Appl-SN-461426; US-Patent-Class-340-347AD) Avail: US Patent and Trademark Office CSCL 09/5

A bipolar digitizer (A/D converter) is disclosed which uses a single comparator circuit for initially determining the polarity of a sampled input signal and for thereafter comparing the absolute magnitude of the signal to an applied ramp voltage. The time required for the ramp voltage to exceed the magnitude of the sampled input signal is converted into a digital waveform representative of the magnitude of the sampled input signal. Resistive means are selectively connected in shunt with a signal storage

capacitor to achieve bipolar signal compression and increased dynamic range. Author (GRA)

N86-15543*# Raytheon Co., Waltham, Mass. Microwave and Power Tube Div.
OPTIMIZATION OF A MAGNET CIRCUIT DESIGN FOR A CYLINDRICAL MASS SPECTROMETER
25 Oct. 1983 12 p Sponsored by NASA
(NASA-CR-176400; NAS 1.26:176400; PT-6440) Avail: NTIS HC A02/MF A01 CSCL 09C

The results of an optimization effort to achieve a minimum weight configuration for a magnetic section circuit (MSC) used in the magnetic portion of a double-focusing mass spectrometer is presented. G.L.C.

N86-15544*# California Inst. of Tech., Pasadena. Power Electronics Group.
INPUT CURRENT SHAPED ac-TO-dc CONVERTERS Semi-annual Status Report
Dec. 1985 38 p refs
(Grant NAG3-615)
(NASA-CR-176438; NAS 1.26:176438) Avail: NTIS HC A03/MF A01 CSCL 09C

Input current shaping techniques for ac-to-dc converters were investigated. Input frequencies much higher than normal, up to 20 kHz were emphasized. Several methods of shaping the input current waveform in ac-to-dc converters were reviewed. The simplest method is the LC filter following the rectifier. The next simplest method is the resistor emulation approach in which the inductor size is determined by the converter switching frequency and not by the line input frequency. Other methods require complicated switch drive algorithms to construct the input current waveshape. For a high-frequency line input, on the order of 20 kHz, the simple LC cannot be discarded so peremptorily, since the inductor size can be compared with that for the resistor emulation method. In fact, since a dc regulator will normally be required after the filter anyway, the total component count is almost the same as for the resistor emulation method, in which the filter is effectively incorporated into the regulator. E.A.K.

N86-15545# Mission Research Corp., Santa Barbara, Calif.
A BRIEF INVESTIGATION OF ADAPTIVE DECISION FEEDBACK EQUALIZATION FOR DIGITAL HF LINKS EMPLOYING PSK (PHASE SHIFT KEYING) MODULATION
B. E. Sawyer 1 Nov. 1983 67 p
(Contract DNA001-80-C-0022)
(AD-A157809; AD-E301748; MRC-R-801; DNA-6319T) Avail: NTIS HC A04/MF A01 CSCL 09/5

Adaptive decision feedback equalization is one of several mitigation techniques that can be employed to improve the performance of narrowband HF modems operating under time and frequency selective channel conditions. The decision feedback equalizer (DEF) is described and several adaptation algorithms are derived. Computer simulations of BPSK HF modems were used to compare link performance (in terms of bit error rate) with and without employment of an adaptive DFE. Also the performance was quantified versus channel disturbance parameters for a specific 2400 band modem. GRA

N86-15546# Stanford Univ., Calif.
NOVEL APPROACHES TO PASSIVATION OF SI FOR VHSIC - BASED ON FUNDAMENTAL STUDIES Final Report, 28 Mar. 1982 - 28 Mar. 1985
W. E. Spicer, I. Lindau, and J. Nogami 24 May 1985 9 p
(Contract DAAG29-82-K-0087)
(AD-A158238; ARO-18679.6-PH) Avail: NTIS HC A02/MF A01 CSCL 09/5

The primary focus of this work was the exploration of fundamental aspects of the oxidation of semiconductor surfaces with a view to addressing some of the problems that have arisen in industry in the growth of ultra thin silicon dioxide layers that are a requirement of smaller, faster CMOS devices. The work falls into three categories, each concerned with a problem that is related to the central issue in a different way: (1) A study of th fundamental properties of the diamond surface. (2) A study of rare earth metal/semiconductor interfaces and compounds. (3) A study of the fundamental characteristics of the oxidation of silicon and the production of thin silicon oxide layers. GRA

N86-15547# Rensselaer Polytechnic Inst., Troy, N.Y. Center for Integrated Electronics.
ELECTRICAL CHARACTERISTICS OF SI DEVICES FABRICATED WITH COMPLETELY CONSUMED CARBIDE (C3) DIELECTRIC ISOLATION PROCESS
W. J. Lu, A. J. Steckl, and T. P. Chow 1985 16 p Prepared in cooperation with General Electric Company, Schenectady, N.Y.
(Contract N00014-81-K-0605)
(AD-A158296) Avail: NTIS HC A02/MF A01 CSCL 09/1

Electrical characteristics of Si devices fabricated with the C3 dielectric isolation process have been investigated. The C3 process produces local field oxide regions due to the differential oxidation rate of SiC versus Si (typically approx. 2-11). Si devices with good electrical properties result when the local oxidation process is allowed to Completely Consume the Carbide (C3) film. This new process is compared to the standard silicon nitride LOCOS process. The bird's beak profiles and the damage on the Si surface resulting from both processes were investigated by SEM and Secco etch, respectively. In order to evaluate the C3 process, MOS capacitors and Schottky barrier diodes have been fabricated with both techniques for varying pad oxide thickness. The measured electrical properties of these devices include lifetime, breakdown voltage, and I-V characteristics. For the minimum bird's beak case (no pad oxide), the C3 process results in superior electrical properties over the standard nitride process. Author (GRA)

N86-15548# Rensselaer Polytechnic Inst., Troy, N.Y. Center for Integrated Electronics.
COMPLETELY CONSUMED CARBIDE (C3) - A NEW PROCESS FOR DIELECTRIC ISOLATION
W. J. Lu, A. J. Steckl, and T. P. Chow May 1985 12 p Presented at the 3rd International Symposium, VLSI Science and Technology, Toronto
(Contract N00014-81-K-0605)
(AD-A158298) Avail: NTIS HC A02/MF A01 CSCL 20/12

A new process for dielectric isolation based on the use of silicon carbide has been investigated. This process uses the lower oxidation rate of SiC compared to Si to provide local regions of thick field oxide. If the local oxidation process results is the complete consumption of the carbide (C3) film, then a high quality MOS structure is obtained. In this paper, this C3 process is compared to the standard silicon nitride LOCOS process. MOS capacitors and Schottky barrier diodes have been fabricated with both techniques for varying pad oxide thickness (0, 100, 200 A). The effect of high temperature anneal on these structures has been investigated. The electrical properties of these devices have been measured. This includes lifetime, breakdown voltage and I-V characteristics. For the minimum bird's beak case (no pad oxide) the C3 process results in superior electrical properties over the standard nitride process. Author (GRA)

N86-15549# Cambridge Univ. (England).
NOVEL TRANSPORT AND RECOMBINATION PROCESSES IN SEMICONDUCTORS Final Technical Report, Mar. 1982 - Jun. 1985
M. Pepper Mar. 1985 40 p
(Contract DAJA37-82-C-0181; DA Proj. 1T1-61102-BH-57)
(AD-A158321) Avail: NTIS HC A03/MF A01 CSCL 20/12

This report describes work on spin dependent recombination processes, electron injection from point contacts into semiconductors and the Quantization of Hall resistance in strong magnetic fields. The work on spin dependent processes has identified spin dependent recombination and generation processes as well as a non-resonant magnetic field effect centered at zero magnetic field. This effect clearly has the same cause as the resonant generation and recombination processes. Resonance effects were constant over a wide range of frequencies confirming theoretical predictions

that this was the case. Work on two dimensional systems has concentrated on the two terminal properties in the regime of quantized Hall resistance. The inversion layer has been shown to behave as a voltage source with quantized impedance. Frequency measurements have shown that fractional quantization can be introduced as integer quantization is destroyed. The frequency dependence is shown to be dependent on sample length, this being the maximum localization length which can occur. Point contact injection from Al and Ag point contacts into Si has been investigated, it is shown that instabilities occur due to coupling between electronics and plasmons. GRA

N86-15550# IBM Watson Research Center, Yorktown Heights, N.Y.
INVESTIGATION OF QUANTUM EFFECTS IN HETEROSTRUCTURES Final Report, 21 Sep. 1981 - 20 Mar. 1985
L. Esaki 20 Mar. 1985 9 p
(Contract DAAG29-81-C-0038)
(AD-A158327; ARO-18683.48-PH) Avail: NTIS HC A02/MF A01 CSCL 20/12

InAs/GaSb and GaSb/AlSb superlattices, GaSb/InAs/GaSb quantum wells and GaAs/GaAlAs heterojunctions were prepared by MBE. Their electronic properties were investigated by optical and transport measurements including photoluminescence, far-infrared magneto-absorption, and the quantized Hall effect. GRA

N86-15551# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
THEORETICAL MODEL OF Hg(1-x)Cd(x)Te PHOTOVOLTAIC AND PHOTOCONDUCTIVE INFRARED DETECTORS
A. A. Fote 12 Aug. 1985 25 p
(Contract F04701-83-C-0084)
(AD-A158668; TR-0084A(5945-07)-1; SD-TR-85-53) Avail: NTIS HC A02/MF A01 CSCL 17/5

Theoretical models have been developed for calculating the spectral responsivity and noise of Hg1-xCdxTe photovoltaic and photoconductive infrared detectors. These models are based on the classical theories for p-n junctions and sweepout-limited photoconductors. They incorporate numerous empirical expressions for describing all important material parameters of Hgx-xCdxTe as functions of the composition parameter x and temperature. The excess carrier lifetimes in n-type material are calculated by including radiative and Auger processes. In p-type material, Shockley-Read recombination is also included when appropriate. Provisions are made to include surface effects in photoconductors, but 1/f noise is neglected. Author (GRA)

N86-15552# Wisconsin Univ., Madison. Dept. of Chemistry.
PHOTOCUMINESCENT RESPONSE OF PALLADIUM-CADMIUM SULFIDE AND PALLADIUM-GRADED CADMIUM SULFO-SELENIDE SCHOTTKY DIODES TO MOLECULAR HYDROGEN
M. K. Carpenter, H. VanRyswyk, and A. B. Ellis 15 Aug. 1985 13 p
(Contract N00014-78-C-0633)
(AD-A158759; UWIS/DC/TR-85/1) Avail: NTIS HC A02/MF A01 CSCL 09/1

The bulk photoluminescence (PL) of Schottky diodes constructed from Pd and n-type CdS (Pd-CdS) and from n-type, graded CdSxSe1-x (0 less than or = x less than or = 1; x - 1 at surface) (Pd-CdSxSe1-x) is sensitive to molecular H2. For the Pd-CdS diode, exposure to H2 (3:1, N2:H2 mixture) significantly enhances the PL intensity of edge emission lambda max (approx. 510 nm) relative to the intensity in air; using a dead-layer model, the corresponding reductions in depletion width and Schottky barrier height can be estimated. For the Pd-CdSxSe1-x diode, H2 changes the spectral distribution; PL from this material, color-coded to spatially resolve e(-)-h(+) pair recombination, indicates the depth over which the electric field is reduced in the semiconductor. These phenomenal demonstrate optically-coupled chemical sensing of hydrogen. Author (GRA)

N86-15553# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
A TWO-TERMINAL MICROELECTROCHEMICAL DIODE WITH CONTACT SPACING OF ABOUT ONE MICRON. A DEVICE BASED ON ONE SOLUTION REDOX COUPLE AND ONE ELECTRODE-CONFINED REDOX COUPLE Interim Technical Report
G. P. Kittlesen and M. S. Wrighton 14 Aug. 1985 36 p
(Contracts N00014-84-K-0553; N00014-84-K-0291)
(AD-A158774; TR-5-ONR) Avail: NTIS HC A03/MF A01 CSCL 09/1

A microelectrochemical diode can be fabricated by functionalizing one of two identical, adjacent platinized Au microelectrodes of an eight electrode microelectrode array with a redox polymer, (BPQ(2+)/(+)n), derived from an N,N'-dibenzyl-4,4'-bipyridinium monomer. The microelectrode array consists of eight Au microelectrodes each about 50 microns long, 2.3 microns wide, and 0.1 microns thick and separated from each other by about 1.3 micron. The array is fabricated on a Si3N4 surface chemically deposited on a Si/SiO2 substrate using conventional microfabrication procedures. Diode behavior is found in aqueous electrolyte solution containing the Ru(NH3)6(3+)/(2+) redox couple which responds reversibly at a platinized Au electrode. Rectifying behavior is obtained, because a micro electrode modified with greater than approx. 0000000001 mol/sq cm of the ((BPQ(2+)(+))n) polymer is capable of reducing the oxidized form of the redox couple (Ru(NH3)6(3+)) but is incapable of oxidizing the reduced form of the redox couple (Ru(NH3)6(2+)). When the negative lead of a power supply is attached to a (BPQ(2+)/(+)n)-derivatized microelectrode and positive lead is attached to an adjacent, naked microelectrode current flows when the applied potential approaches the difference in the formal redox potentials of the Ru(NH3)6(3+)/(2+) and (BPQ(2+9/(+)n redox couples, about 0.4 V. When the potential is applied in the opposite sense, no current flows. GRA

N86-15554# Spire Corp., Bedford, Mass.
IMPROVED LIFETIME HIGH VOLTAGE SWITCH ELECTRODE Final Report, 1 Sep. 1984 - 31 May 1985
W. Halverson 28 Jun. 1985 49 p
(Contract F49620-84-C-0120)
(AD-A158961; SPIRE-FR-60053; AFOSR-85-0733TR) Avail: NTIS HC A03/MF A01 CSCL 09/1

In this Phase 1 Small Business Innovation Research (SBIR) program, preliminary tests of ion implantation to increase the lifetime of spark switch electrodes have indicated that a 185 keV carbon ion implant into a tungsten-copper composite has reduced electrode erosion by a factor of two to four. Apparently, the thin layer of tungsten carbide (WC) has better thermal properties than pure tungsten; the WC may have penetrated into the unimplanted body of the electrode by liquid and/or solid phase diffusion during erosion testing. These encouraging results should provide the basis for a Phase 2 SBIR program to investigate further the physical and chemical effects of ion implantation on spark gap electrodes and to optimize the technique for applications. GRA

N86-15555# Naval Postgraduate School, Monterey, Calif.
SILICON COMPILER DESIGN OF COMBINATIONAL AND PIPELINE ADDER INTEGRATED CIRCUITS M.S. Thesis
A. O. Froede, III Jun. 1985 140 p
(AD-A158995) Avail: NTIS HC A07/MF A01 CSCL 09/5

The architecture and structures used by the MacPitts silicon compiler to design integrated circuits are described, and the capabilities and limitations of the compiler are discussed. The performance of several combinational and pipeline adders designed by MacPitts and a hand-crafted pipeline adder are compared. Several different MacPitts design errors are documented. Tutorial material is presented to aid in using the MacPitts interpreter and to illustrate timing analysis of MacPitts-designed circuits using the program Crystal. GRA

N86-15556# North Carolina Univ., Chapel Hill. Dept. of Chemistry.
MICRON-SPACED PLATINUM INTERDIGITATED ARRAY ELECTRODE: FABRICATION, THEORY AND INITIAL USE
R. W. Murray Sep. 1985 26 p

(Contract N00014-82-K-0337)
(AD-A159429; TR-16) Avail: NTIS HC A03/MF A01 CSCL 09/1

An interdigitated array (IDA) electrode composed of 40 pairs of 0.3 micrometers thick Pt fingers 3.5 micrometers wide and separated by 2.5 micrometer gaps of insulating borosilicate glass substrate has been fashioned by a modified microlithographic technique. The two IDA is applied to measurement of redox electron conduction through films of poly-Os(bpy)2 (vpy)2 (C1O4)2, poly-CRu(bpy)2 (vpy)2 (C104)2, and Prussian Blue that had been electrochemically deposited over the Pt fingers and in the insulating gaps. Appropriate theory for using the IDA for this purpose is developed. Electrochemically generated luminescence from solutions of Ru(bpy)3 (2+) is also observed with the IDA.
Author (GRA)

N86-15557# Naval Postgraduate School, Monterey, Calif.
VLSI (VERY LARGE SCALE INTEGRATED) DESIGN OF A SIXTEEN BIT PIPELINED MULTIPLIER USING THREE MICRON NMOS TECHNOLOGY M.S. Thesis
R. J. Simchik, Jr. Jun. 1985 95 p
(AD-A159433) Avail: NTIS HC A05/MF A01 CSCL 09/5

The application of computer-aided design (CAD) tools in the full custom design and testing of a 16-bit pipelined two's complement multiplier in three micron NMOS is described. A comparison between the full custom carry-save addition (CSA) multiplier designed using CAD tools and a multiplier generated by the MacPitts silicon compiler is presented. Additional background material is also presented on the CSA multiplication algorithm used. GRA

N86-15558# Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Development and Operations Div.
ACCEPTANCE TEST PLAN FOR BROADBAND MICROWAVE AMPLIFIER PANEL
R. R. Barron 5 Aug. 1985 6 p
(Contract N00014-84-C-2232)
(AD-A159450) Avail: NTIS HC A02/MF A01 CSCL 09/5

Acceptance tests for the broadband 10 KW panel developed under the microwave amplifier module program are designed to show that the delivered unit meets performance requirements in the areas of bandwidth, power output, pulse drop and tolerance to load impedance variations. When coupled with the special reliability tests described in document DSC-13509, these tests will also verify the thermal data used as an input to the reliability model for the amplifier. Since this is a research and development program with a high degree of flexibility in performance parameters, data will be taken for a great variety of pulsewidth, duty, and cooling conditions. The data from these other test conditions will be included in the final report, and made available at the time of the acceptance tests. The acceptance test procedures described herein for each testing category define the tests to be performed, parameters, ranges, special test equipment, and interface requirements. GRA

N86-15559# Department of the Air Force, Washington, D.C.
A BUFFER DIVERTER SYSTEM Patent Application
J. C. Foster, Jr., inventor (to Air Force) Filed 25 Jul. 1985 22 p
(AD-D011902; US-Patent-Appl-SN-758928) Avail: NTIS HC A02/MF A01 CSCL 19/2

The prevention of sympathetic detonations between donor and acceptor bombs, which are stored lying horizontally lying parallel to each other, is accomplished using a buffer diverter system. One example of a buffer diverter system is a pair of molded concrete bases, each supporting a horizontal bomb and conforming to the shape of its respective bomb up to its horizontal centerline. In the first example, the entire space between the two molded concrete bases and bombs is filled in with a buffer which has sufficient width to attenuate the shock of detonation down pressure levels below a pressure threshold needed to induce an acceptor bomb to sympathetically detonate. In another example of a buffer diverter system, the buffer is replaced with a diverter. The diverter is an I-beam which abuts each bomb at its horizontal centerline and runs the length of the two bombs. The I-beam has the same width as the buffer, but its surface area presented to each bomb is nearly the minimum required to deflect fragments from the silhouette of the acceptor bomb. GRA

N86-15560# Nationaal Inst. voor Kernfysica en Hoge Energiefysica, Amsterdam (Netherlands). Sectie-K.
ACCELERATOR TIMING SYSTEM [VERSNELLER-TIMING SYSTEEM]
E. Timmer and E. Heine 1 Jul. 1985 36 p refs In DUTCH
(LINO-109) Avail: NTIS HC A03/MF A01

An electron accelerator timing signal system providing synchronous operation of all apparatus, is described. Four timing signals, a 2 MHz clock frequency, a 2.5 kHz master pulse, a 10 Hz walk pulse, and a synchronous pulse are transported to the modulator stations. Triggers for the stations are divided from the 2.5 kHz master pulse to the appropriate modulator frequency; mutual synchronization is assured by the 10 Hz walk pulse. The synchronous pulse is also used for this purpose, on initiation by an operator or program. For triggering the beam synchronic apparatus and scopes, a separate beam synchronous pulse, induced in a trigger modulator, is provided. Author (ESA)

N86-15561# Joint Publications Research Service, Arlington, Va.
USSR REPORT: ELECTRONICS AND ELECTRICAL ENGINEERING
30 Apr. 1985 93 p Transl. into ENGLISH from various Russian articles
(JPRS-UEE-85-006) Avail: NTIS HC A05/MF A01

Current developments in electronics and electrical engineering from the USSR are presented. Some of the topics discussed include: (1) antennas and propagation; (2) broadcasting and consumer electronics; (3) circuits and systems; (4) communications; (5) components, hybrids and manufacturing technology; (6) electrical insulation; (7) electromagnetic compatability; (8) electron devices; (9) industrial electronics and control instrumentation; (10) instrumentation and measurements; (11) magnetics; (12) microwave theory and techniques; (13) power engineering; (14) quantum electronics and electro-optics; (15) solid state circuits; (16) sonics and ultrasonics; and (17) transportation. For individual titles, see N86-15562 through N86-15622.

N86-15562# Joint Publications Research Service, Arlington, Va.
SOLUTION TO REVERSE REFRACTION PROBLEM Abstract Only c32
A. G. Pavelyev *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 1 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 9, Sep. 1994 p 1658-1667 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The reverse refraction problem (determination of radial profile of refractive index in planetary atmospheres, such as Earth, from radio probe measurements) is formulated as a bistatic radar problem for a spherically symmetric medium. The modified refractive index n(r)r (a-radius at which the refraction angle as function of relative distance is measured) is assumed to reach extreme values at the upper boundary r sub 1 or at observation level. Before the corresponding Fredholm equation of the first kind can be solved, it must be well-conditioned in the Tikhonov sense. This is done here by two quasi-optimum integral transformation variants with respect to the measurement function and subsequent simplified regularization. The first method is two successive Fourier cosine transformations followed by an Abel transformation, with the possibility of discrete Fourier transformations and numerical Abel transformation. The second method is twofold discrete Fourier transformation. Both yield solutions readily evaluated by simple algorithms. Regularization is effected by approximating functions satisfying the two fundamental conditions for convergence required of the measurement function. Author

N86-15563# Joint Publications Research Service, Arlington, Va.
MAXIMUM ANTENNA POWER RECEPTION IN LOSSY MEDIUM

Abstract Only **c32**
Ya. N. Feld *In its* USSR Report: Electronis and Electric Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 1-2 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 9, Sep. 1984 p 1668-1676 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The power problem of a receiver antenna is a lossy medium with the incident electromagnetic field of a wave from two current generators is solved on the basis of circuit theory with no constraints on antenna directivity. Maximum antenna reception power is calculated on assumption that single-mode feeder channel is perfectly matched to receiver and that this maximum is finite as long as electrical conductivity of medium is not zero. The optimum radiation pattern of this antenna is then calculated; in particular the field distribution on a surrounding surface for antenna in transmitter mode which ensures pickup of maximum power when antenna is in receiver mode. Author

N86-15564# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF POINT SOURCE IMAGE FIELD STRUCTURE BY REAL RADIOOPTICAL ANTENNA Abstract Only **c32**
F. Kh. Baybulatov and M. I. Kudryashov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 2 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 9, Sep. 1984 p 1677-1683 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The reverse electrodynamic problem (determination of field structure in point source image and design of a radiooptical antenna for this purpose) is solved rigorously by taking into account arbitrariness of active surfaces and corresponding variations in number of field components in real antennas. Firstly, field components in the geometric optic approximation are computed after replacement of antenna readings by an equivalent field on some surface in the image space. Secondly, field components and the average-in-time relative distribution of electric energy density in the image are computed by conventional electrodynamics methods, with the corresponding integral equations for an open region excluding its boundary transformed into equations for Kirchhoff-Kottler integrals. Theoretical results for a lense with large relative aperture were checked against experimental data for a lens cut on a lathe without finishing surface treatment. In the experiment, amplitude-modulated radiation from a microwave oscillator was passed through a stationary rectangular single-mode waveguide with 1.6x0.8 sq. mm. cross section whose open other end simulated a point source. Analysis of results showed unequal energy density distributions along the two principal orthogonal coordinate axes in the large plane indicating partial polarization of radiation by the antenna focusing lens. Author

N86-15565# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF MAGNETOSTATIC WAVE PROPAGATION THROUGH FILM WAVEGUIDES Abstract Only **c32**
G. M. Novikov and Ye. Z. Petrunkin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 3 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 9, Sep. 1984 p 1691-1695 Original language document was announced in IAA as A85-10431 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Experimental results are presented concerning the characteristics of magnetostatic waves (MSWs) propagating in a ferromagnetic-film waveguide whose width is comparable to the wavelength. A constant magnetic field was applied in the waveguide plane and formed an arbitrary angle theta with the waveguide axis. Experimental and calculated MSW dispersion curves are compared for theta = 90 deg. Backward surface waves were observed experimentally in the case of longitudinal (theta = 0 deg) magnetization of the waveguide. Forward and backward surface MSWs were observed simultaneously at theta = 60-90 deg. Author

N86-15566# Joint Publications Research Service, Arlington, Va.
STATISTICAL CHARACTERISTICS OF ULTRASHORT-WAVE SIGNAL FAST PHASE FLUCTUATIONS BASED ON AMPLITUDE MEASUREMENTS ON SEA LANES Abstract Only **c32**
B. S. Rybakov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 3-4 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 9, Sep. 1984 p 1720-1725 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Statistical characteristics of fast phase fluctuations in ultrashort-wave signal (time correlation interval and rms magnitudes and ratio of maximum to minimum rms) were calculated from measurements over 225-420 km long sea lanes for signals with three different wavelengths (10, 36, 190 cm). Data were processed according to the general Gauss model applicable to a large class of communication channels with time fluctuations assumed to have a symmetric spectrum. Integral distribution functions characterizing monthly and yearly cycles as well as the wavelength dependence of the medium time correlation interval were evaluated on this basis and separately for day and night. Author

N86-15567# Joint Publications Research Service, Arlington, Va.
ESTIMATING NUMBER AND PARAMETERS OF SIGNAL COMPONENTS IN PRESENCE OF NOISE Abstract Only **c32**
A. A. Kuriksha *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 4-5 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 9, Sep. 1984 p 1740-1744 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

An algorithm is constructed for extimating the number and parameters of signal components in a signal noise mixture based on a minimum average risk criterion with special choice of cost function and a simplifying assumption on apriori distribution. Intuitively the number of signal components is expected to be the minimum most likely number not including false noise components. A cost function asymmetric with respect to the true number and parameter values is selected consisting of a principal part, a simple function of the number and signal component amplitudes and parameters and an additional term which is a constant multiplied by the sum of decision rules for a possible larger number of components. An increase of the probability of correct detection when the estimated number of signal components is increased by one is the measure of likelihood. The minimum average risk function is maximized by maximum-likelihood extimates and by a reasonable assumption of quasi-uniform apriori distribution. Protection against overestimates is built into this algorithm since each addition of one to the estimated number of signal components increases the number of alternatives for selection of parameters while the error penalty for their number and values is assumed the same. Author

N86-15568# Joint Publications Research Service, Arlington, Va.
MODULAR FLOATING DECIMAL POINT OPERATIONS FOR ANTENNA ARRAY ADAPTATION Abstract Only **c32**
V. V. Kryuchkov, V. P. Leevshin, V. F. Strucheev, and A. G. Kharitonov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006-) 30 Apr. 1985 p 5 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 9, Sep. 1984 p 1754-1756 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

An adaptive signal processing algorithm for antenna arrays is proposed with modular floating decimal point arithmematic operations usable when vector and matrix arrays are of common order and ensuring stable and efficient interference suppression at almost the same hardware cost as for fixed arithmetic. The interference suppression factor depends on calculation sequences and site of rounding, and on sample size which can be kept yp by retaining only real part of denominator with discard of error-producing

imaginary part and omission of rounding in summation of component scalar vector products since scaler multiplication of two vectors is base algorithm operation. A typical algorithm use is adaptive signal processing in phased antenna array after partial beam formation. The reflected signal envelope is assumed to have complex amplitude with zero mean normal distribution and random side lobe radiation pattern. Input signals are sampled by analog-to-digital converters, whose output signal matissa is limited by input quantization step. Regularization factor increase leads to increase and stabilization of interference suppression factor, as sample size approximates and exceeds number of interference signals. When sample is small phased antenna array efficiency falls sharply where ideal machine arithmetic is approached as regularization factor increases to infinity. This is now the case with finite arithmetic so that regularized correlation matrix estimates are not needed.
Author

N86-15569# Joint Publications Research Service, Arlington, Va.
LOCAL IONOSPHERIC IRREGULARITY EFFECT ON ELF RADIOWAVE PROPAGATION Abstract Only c32
A. P. Nikolayenko *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 8 Transl. into ENGLISH from Izvestigy Vysshikh Uchebnykh Zavedeniy: Radiofizika (Gorkiy, USSR), v. 27, no. 10, Oct. 1984 p 1227-1237 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The Stratton-Chu integral equation is used to solve the ELF radiowave propagation electrodynamic problem over an irregular spherical interval between the ground and ionosphere. The Stratton-Chu formula makes it possible to obtain field estimates in Born approximation with allowance for the vector nature of the electrodynamic field. Changes are investigated in the perturbation of the vertical electrical field component as the irregularity moves along the line between the source and the observer and across the propagation path. It is found that a local irregularity above the source or observer can change the field level significantly as compared with a uniform resonator, especially near the antipodes of the source.
Author

N86-15570# Joint Publications Research Service, Arlington, Va.
IONOSPHERE INFLUENCE ON MHD WAVE BUNDLE PROPAGATION Abstract Only c32
L. S. Alperovich and Ye. N. Fedorov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 8 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radiofizika (Gorkiy, USSR), no. 27, no. 10, Oct. 1984 p 1238-1247 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The horizontal propagation of geomagnetic variations with periods exceeding 30 seconds excited by bundles of hydromagnetic waves of varying polarization is investigated. The primary magnetic field is assumed to be orthogonal to the ionosphere and the Earth's suface. Expressions are derived for fields at long distances from the source. When the distances are sufficient, the wave is found to travel along the ground at the Alfven velocity.
Author

N86-15571# Joint Publications Research Service, Arlington, Va.
CONTRIBUTION TO MULTILAYER SPHERICAL SCREEN THEORY Abstract Only c32
V. L. Avramenko and V. N. Krasilnikov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 10 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radiofizika (Gorkiy, USSR), v. 27, no. 10, Oct. 1984 p 1299-1305 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The incidence of a plane electromagnetic wave on a sphere consisting of an arbitrary number of layers with different electrodynamic properties is examined and it is shown that the exact solution of the diffraction problem can be described and investigated analytically. The influence of the dielectric space between the metal layers on the shielding properties of a spherical shell is studied. If the width of the space is smaller than the thickness of the skin layer in the middle, the space has little influence on the shielding of the magnetic field. The influence of the space is also smaller in metals with high magnetic permeability if the width of the space exceeds the thickness of the skin layer in the middle.
Author

N86-15572# Joint Publications Research Service, Arlington, Va.
ADIABATIC INVARIANT VALUE VARIATION UNDER SHORT-WAVE BAND SUBCRITICAL CONDITIONS Abstract Only c32
K. V. Svistunov and M. V. Tinin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 11 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radiofizika (Gorkiy, USSR), v. 27, no. 10, Oct. 1984 p 1340-1343 Original language document was announced in IAA as A85-17467 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The possibility of significant variations of the adiabatic invariant is examined for the propagation of radio waves in an irregular Earth-ionosphere waveguide with a parabolic dependence of permittivity on height. Numerical and analytical results indicate that nonexponential deviations of the adiabatic invariant can occur not only when the characteristic size of horizontal irregularity decreases (e.g., during resonant beam excitation) but also in quasi-critical conditions and for smoothly irregular waveguides.
Author

N86-15573# Joint Publications Research Service, Arlington, Va.
DEGRADATION OF SURFACE-ACOUSTIC-WAVE RESONATORS Abstract Only c32
M. A. KRevskiy, M. S. Sandler, and A. V. Yakimov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 12-13 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 11, Nov. 1984 p 2101-2104 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Degradation of SAW resonators is analyzed, the irreversible upward frequency drift in the case of interdigital transducers with aluminum pin-electrode is explained by logarithmic oxidation faster than normally but the irreversible downward frequency drift in the case of interdigital transducers with gold pin-electrodes is evidently caused by oxidation together with diffusional smear. This latter mechanism is analyzed on the basis of a model which describes flicker fluctuations as a microprocess of thermodynamic aging. Calculations are made for the simplest oscillator consisting of two identical interdigital structures on a delay line each having N pin pairs.
Author

N86-15574# Joint Publications Research Service, Arlington, Va.
EFFECT OF CYLINDRICAL RERADIATOR ON PARAMETERS OF ANTENNA AND ANTENNA ARRAY Abstract Only c32
B. M. Levin and S. S. Fomintsev *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 13 Transl. nto ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 11, Nov. 1984 p 2140-2147 Original language document was announced in IAA as A85-15684 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

An analysis is made of the effect of a cylindrical reradiator on the electrical characteristics of a rod antenna and an array of rod antennas. The study is based on the replacement of the cylinder by a model of nonintersecting wires and on the method of moments. Experimental data are used as the calculation correctness criterion, and methods for improving the calculation efficiency are examined.
IAA

N86-15575# Joint Publications Research Service, Arlington, Va.
BASIC CHARACTERISTICS OF RADAR ANTENNA WITH SYNTHESIZED APERTURE TRACKING ARBITRARY MOTION OF AIRCRAFT Abstract Only c32
Ya. S. Itskhoki, N. A. Sazonov, and Ye. F. Tolstov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 14 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 11, Nov. 1984 p 2164-2172 (For primary document see N86-15561 06-33)

Avail: NTIS HC A05/MF A01

A problem in tracking the motion of an aircraft which carries a radar antenna with synthesized aperture are random phase fluctuations of the input signal. These fluctuations, caused by instability of the aircraft trajectory and elastic vibrations of the aircraft structure as well as by tropospheric effects and intentional interference, worsen the azimuth resolution and the accuracy of azimuth determination. This situation is analyzed here for the more general case of arbitrary motion of the aircraft and arbitrary observation angle rather than for rectilinear motion and lateral observation. The output signal serves as performance criterion, its waveform being determined principally by the radiation pattern of the real antenna and its modulus remaining approximately constant over the aperture synthesization time. On this basis, the trajectory of the phase center of the real antenna can be approximated with a quadratic parabola. For given wavelength and elevation angle, the best azimuth resolution attainable with signal processing by the straight convolution method (second target on observation line) is determined by the length of aperture synthesization time, the tangential component of aircraft velocity, and the form of the weight function. In the absence of phase fluctuations, the error of azimuth determination is in this case determined only by the resolving power of the radar with synthesized antenna aperture. Signal processing by the harmonic analysis method introduces some defocusing, which worsens the resolution, even in the absence of phase fluctuations. Author

N86-15576# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF RADAR OBJECTS DETECTABLE BY SUPERWIDE-BAND SIGNALS Abstract Only c32
L. Yu. Astanin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 15-16 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 11, Nov. 1984 p 19-24 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Use of superwide-band probing signals for detection of intricate objects is examined with the object scattering characteristic as the criterion. The resolving power of such signals is compared with that of narrow-band signals, especially high-resolution narrow-band signals. The global frequency characteristics of scattered signals or the pulse response will describe an object, especially when the polarized components of both probing signal and echo signal are taken into account. Changes in the global scattering pattern which are associated with the form and the orientation of the object can result in superresolution, namely transformation of a single probing signal into a packet of pulses. A typical superwide-band signal is a short radio pulse, usually produced with the aid of a matched filter unless it is a simple one. The bandwidth of such a pulse is defined as 4-times the inverse of its duration and then referred to the carrier frequency so that the relative bandwidth becomes equal to twice the inverse of the number of carrier periods during the pulse. Both frequency characteristic and pulse response of an object are related to the Green function, in the space domain and in the time domain respectively, in the electrodynamic problem of scattering and diffraction with interference. Author

N86-15577# Joint Publications Research Service, Arlington, Va.
REFLECTION COEFFICIENT OF HARROW GRATING WITH CONDUCTOR STRIPS WITH RESPECT TO ELECTROMAGNETIC WAVES Abstract Only c32
V. I. Ponomarenko, D. I. Mirovitskiy, and I. F. Budagyan *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 16 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 11, Nov. 1984 p 68-71 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The reflection coefficient of harrow microwave gratings with conductors on a metal mirror base is calculated by a method not only more accurate but also less unwieldy than the conventional method of partial regions. Bar conductors of finite thickness are replaced with ribbon conductors of a form approximately describable by 0o-functions, which taper them to infinitesimally thin ones and thus reduces the three-dimensional grating to a two-dimensional one. The effective conductor thickness is now much smaller than the grating period and than the skin depth. Both reflection and absorption coefficients become independent of the frequency, and the transcendental dispersion equation for the propagation constant simplify as a result of easier solution by numerical methods. With the absorption layer superposable on the dispersion layer, the reflection factor is calculated specifically for waves with E-polarization, by reduction of the corresponding diffraction problem to an infinite system of linear algebraic equations. Author

N86-15578# Joint Publications Research Service, Arlington, Va.
MODULATION INSTABILITY AND SOLITONS OF ELECTROMAGNETIC WAVE ENVELOPES IN FERROMAGNETIC SEMICONDUCTORS Abstract Only c32
F. G. Bass and N. N. Masonov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 19 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy Radiofizika (Gorkiy, USSR), v. 27, no. 11, Nov. 1984 p 1460-1467 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Nonlinear electromagnetic waves in a uniaxial ferromagnetic semiconductor located in a homogeneous magnetic field are considered. The propagation of nonlinear spin-spiral waves is analyzed within the frame-work of the hydrodynamic description of conductivity electron plasma. A material equation for the spin subsystem is the Landau-Lifshits equation, with allowance for inhomogeneous exchange, magnetic anisotropy and magnetic dipole interaction. Weakly nonlinear electromagnetic waves propagating along the magnetic field parallel to the axis of anisotropy of the semiconductor are analyzed. Solitons of the envelopes of spin-spiral waves are studied with no assumptions regarding the smallness of their amplitude. Author

N86-15579# Joint Publications Research Service, Arlington, Va.
DIGITAL METHODS OF RECORDING COLOR TELEVISION IMAGES ON FILM TAPE Abstract Only c35
R. Ya. Krivitskaya and V. M. Semenov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 21-22 Transl. into ENGLISH from Tekhnika Kino i Televideniya (Moscow, USSR), no. 11, Nov. 1984 p 31-35 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Three methods are now available for recording color television images on film tape, directly or after appropriate finish of signal processing. Conventional recording of images from the screens of three kinescopes with synthetic crystal face plates is still most effective for high fidelity. This method was improved by digital preprocessing of brightness color-difference signal. Frame-by-frame storage of these signals in the memory in digital form is followed by gamma and aperture correction and electronic correction of crossover distortions in the color layers of the film with fixing in accordance with specific emulsion procedures. The newer method of recording color television images with line arrays of light-emitting diodes involves dichromic superposing mirrors and a movable scanning mirror. This method allows the use of standard movie cameras, simplifies interlacing-to-linewise conversion and the mechanical equipment, and lengthens exposure time while it shortens recording time. The latest image transform method requires an audio-video recorder, a memory disk, a digital computer, and a decoder. The 9-step procedure includes preprocessing the total color television signal with reduction of noise level and time errors, followed by frame frequency conversion and setting the number of lines. The total signal is then resolved into its brightness and color-difference components and phase errors and image blurring are also reduced. After extraction of R,G,B signals and colorimetric matching of TV camera and film tape, the simultaneous R,B, B signals are converted from interlacing to sequential triades of color-quotient frames with linewise scanning at triple frequency. Color-quotient signals are recorded with an electron beam on a smoothly moving black-and-white film tape under vacuum. While digital techniques improve the signal quality and simplify the

control of processes, not requiring stabilization of circuits, image processing is still analog. Author

N86-15580# Joint Publications Research Service, Arlington, Va.
COLOR-ENCODING RASTER LIGHT FILTERS FOR SINGLE-TUBE COLOR TELEVISION CAMERAS Abstract Only
V. M. Ivanova, L. A. Lyubavskaya, Yu. N. Tarasov, and M. N. Cherapanova *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 22 Transl. into ENGLISH from Tekhnika Kino i Televideniya (Moscow, USSR), no. 11, Nov. 1984 p 44-48 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Raster light filters for strip or facsimile color encoding consist of two or three line arrays: one transmits red and green light, the second transmits blue and green light, the third, optional, transmits blue and red light. Optical color encoding is based on frequency separation of color signals and requires inclusion of a corrective light filter. The performance of filter structures is determined by the spectral characteristics of the color strips, these characteristics having been calculated here for a Standard System television receiver and a 6500 K white light reference source with the L sub R: L sub C: L sub B=0.3:0.59:0.11 ratio of liminance coefficients. Three configurations for alignment of the light filters with the phototarget in a single-tube camera are evaluated, direct superposition by building the light filters into the phototarget being more expedient than placing the light filters in the plane of the intermediate image or using a fibrous face plate underneath the phototarget as entrance window. Multilayer interference coatings based on refractory oxide layers ensure the necessary spectral characteristics. The photolithographic technology has been adapted to such filters, reverse photo-lithography with masking and selective etching applicable here. Refractive oxide layers do not require strong etchants. Photoresist masks remaining stable thermally and chemically up to 250 C are much better than bimetal ones, they cut the processing time almost to one half. The technology has been verified experimentally. Author

N86-15581# Joint Publications Research Service, Arlington, Va.
IMPROVEMENT OF COLOR REPRODUCTION BY TELEVISION CAMERAS Abstract Only
G. V. Luriye *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 23 Transl. into ENGLISH from Tekhnika Kino i Televideniya (Moscow, USSR), no. 11, Nov. 1984 p 61-63 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Two colorimetric methods of checking and adjusting individual television cameras for accurate color reproduction are compared, namely vector measurements and comparison of signal levels in the R-G-B channels. A special color test table was prepared which is more suitable for both methods than the 0569 table or other analogous tables used in other countries. This table lists the reflection coefficients of 10 color specimens ranging from yellow to violet and including white at 13 different wavelengths from 440 to 660 nm spaced 20 nm apart. On the basis of this table the reflection spectrum of each reference specimen was plotted for subsequent calculation of chromaticity coordinates relative to a D65 white light source. The vector method of checking the chrominance characteristics of system signals is most appropriate for inspection of camera channels and encoders, as well as for locating sources of color distortions and tolerancing the latter. This method involves applying one color-difference signal to the vertical-deflection amplifier and another one to the horizontal-deflection amplifier so that the vector diagram of the color test table will appear on the screen in the form of light spots whose location is determined by the chromaticity and the degree of saturation. Author

N86-15582# Joint Publications Research Service, Arlington, Va.
LUMINESCENCE PHOTOGRAPHY Abstract Only **c35**
V. B. Nazarov and M. V. Alfimov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 23-24 Transl. into ENGLISH from Zhurnal Nauchnoy i Prikladnoy Fotografii i Kinematografii (Moscow, USSR), v. 29, no. 4, Jul. - Aug. 1984 p 307-315 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The development of luminescence photography is traced briefly, and descriptions are given of the photographic process and the principles underlying luminescence photography. It is found that luminescence photography has certain advantages over other types of photography, including the possibility of recording an image on luminescent material so that it cannot be seen under natural light, but can be read out through a luminescent means. This property can be exploited for marking articles and for placing sound tracks on movie film. Luminescence photography can be used to record latent images without using chemical intensification. The use of luminescence photography is determined to a significant extent by the performance of the reproducing equipment. Author

N86-15583# Joint Publications Research Service, Arlington, Va.
DESIGN OF DIFFERENTIAL CIRCUIT FOR LSI N-THRESHOLD COMPARATOR Abstract Only
A. I. Kondalvev and Yu. M. Greshischev *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 29 Transl. into ENGLISH from Elektronnoye Modelirovaniye (Kiev, USSR), v. 6, Jul. - Aug. 1984 p 33-36 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The static mode of the analog element of an N-threshold comparator (differential comparison circuit) is analyzed in order to find the relationship between the parameters that determine the static accuracy of the comparator and the number N and spacing of its threshold levels. Analysis of the differential circuit makes it possible to estimate the maximum number of threshold levels of the comparator and the word length of the analog-digital converter. The step of the threshold levels is at least 120 mV; therefore, the number N is limited by the acceptable dynamic range of the signal at the input to the comparator of the large scale integration analog-digital converter. Consequently, N sub max = (5V/120mV) -1 approximately 42. if the quantity is n >, 6, two or more comparators with the maximum number of thresholds can be employed in the low order bits; however, coding elements are required in this case. A similar treatment can be employed if the restrictions on the number N are determined by the acceptable value of U sub o(N) rather than the dynamic range. Author

N86-15584# Joint Publications Research Service, Arlington, Va.
EFFICIENCY OF STORING PULSE PRODUCTS IN COHERENT SIGNAL PACKETS Abstract Only
V. V. Latushkin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 31 Transl. into ENGLISH from Radiotekhnika i Elektronike (Moscow, USSR), v. 29, no. 9, Sep. 1984 p 1832-1833 Original language document was announced in IAA as A85-10444 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

An analysis is made of the characteristics of the detection of a packet of pulses on a background of white (delta-correlated) noise during the integration of pulse products in a radar receiver. Coherent and incoherent integration techniques are compared, and it is shown that the coherent technique results in a smaller energy loss than the incoherent technique. Another advantage of the coherent technique is the possibility of measuring the rate of motion. B.J. (IAA)

N86-15585# Joint Publications Research Service, Arlington, Va.
EFFICIENCY OF AMPLITUDE SUPPRESSION ON SINUSOIDAL INTERFERENCE Abstract Only
V. A. Danilov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 31-32 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 9, Sep. 1984 p 1836-1838 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Polygonal approximation of nonlinear conversion is considered for amplitude suppression of non-Gaussian interference, specifically sinusoidal, with predominance of radio-frequency components in spectrum. Sinusoidal interference is defined as additive mixture of Gaussian white noise and harmonic fluctuations with constant amplitude and frequency but random initial phase uniformly distributed over the -pi, pi interval and arbitrary phase modulation. Statistical characteristics of this interference are functions of a parameter representing ratio of harmonic fluctuation power to Gaussian noise power. The amplitude suppression factor characterizing efficiency of the nonlinear converter, i.e., signal-to-interference ratio at output divided by signal-to-interference ratio at input, is calculated taking into account converter amplitude characteristic relative to fundamental frequency component and envelope distribution over interference. Results showed that amplitude suppression with a polygonal converter is somewhat less efficient than optimal amplitude suppression but simpler to implement than amplitude suppression with polynomial converter. Author

N86-15586# Joint Publications Research Service, Arlington, Va.
LOWER LIMIT OF ERROR PROBABILITY IN DISCRETE ADDITION OF BINARY SIGNALS FROM PARALLEL CHANNELS Abstract Only **c32**
Ye. D. Kononov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 35 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 11, Nov. 1984 p 57-59 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Addition of binary signals from parallel channels with variable parameters and finite number of states is examined, specifically, discrete addition in diversity receivers. An algorithm of optimal addition is constructed for binary channels conforming to the Markov model and forming together a discrete vector channel and the probability of addition error is calculated assuming the states of this discrete vector channel to be exactly known. Weighted sampling, which improves the reliability in the case of duplications, is found to be optimal and simplified appreciably in the case of independent constituent channels. The mean probability of addition error, obtained by averaging over all channel states, is the lower limit of this probability and characterizes the maximum possible interference immunity of discrete signal addition. As an example, the latter is evaluated for three statistically uniform and independent discrete states. Author

N86-15587# Joint Publications Research Service, Arlington, Va.
METHODS OF EQUALIZING ELECTRIC FIELDS IN HIGH-VOLTAGE DEVICES Abstract Only
L. D. Ginzburg, R. S. Ibragimov, and B. A. Korotkin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 38 Transl. into ENGLISH from Elektrotekhnika (Moscow, USSR), no. 11, Nov. 1984 p 55-57 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Size and weight reduction of high-voltage devices depends on an insulation system which ensures a uniform, or almost uniform, electric field distribution over the surface. This in turn requires large metal backup parts and their monolithic bonding to the dielectric part, a source of high thermoelastic stresses. The problem of reducing these stresses is analyzed on the basis of the equation of elasticity for a monolithic insulator with metallized inside wall and metal mounting endpiece. According to the solution of this equation, the thermoelastic stress between dielectric and metal depends on the difference between their linear thermal expansion coefficients and on the ratio of their Young's moduli. Reliable performance requires that the thermoelastic stress be 20 to 50% lower than the ultimate tensile strength of the dielectric and the ultimate adhesive strength of the dielectric-metal bond, these levels being determined principally by the thermal relaxation characteristics of the dielectric. An evaluation of various materials and manufacturing methods indicates that both equalization of electric fields and minimization of thermoelastic stresses are attainable by using ceramic materials or polymer molding compounds for insulators, with a shielding brass mesh rolled into a wire ring for weakening the edge effect and raising the mechanical strength. Author

N86-15588# Joint Publications Research Service, Arlington, Va.
DEPENDENCE OF ELECTRIC CURRENT THROUGH HUMAN BODY ON PARAMETERS OF 3-0 NETWORK IN RANGE OF HIGH INSULATION ADMITTANCE Abstract Only
F. Ya. Motuzko and A. V. Trubitsyn *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 39 Transl. into ENGLISH from Elektrotekhnika (Moscow, USSR), no. 11, Nov. 1984 p 58-60 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The electric current I sub h through a human body touching one phase of a 3-0 network is calculated on the basis of the conventional equivalent circuit for the general case of unequal insulation admittances in all three phases. The two extreme cases here are all three insulation admittances approaching zero or infinity respectively. The theoretical relation in the latter case is not consistent with reality, in which an infinitely large insulation admittance presents a short circuit across the 3-0 source and a fully effective shunt across the human body. The equivalent circuit is modified, accordingly, to include the internal source resistance in series with the insulation admittance in each phase. Calculations pertaining to the method of personnel protection are continued, to establish the dependence of current on the insulation resistance of the touched phase and thus establish the safe range of this resistance when the resistance as well as the insulation admittance of this phase are different from those of the other two phases and those of the other two phases are equal. Author

N86-15589# Joint Publications Research Service, Arlington, Va.
RATE OF WIDENING OF STRONG-FIELD DOMAIN IN SUPERCRITICALLY DOPED GUNN-EFFECT DEVICES Abstract Only **c76**
L. S. Chkhartishvili, Z. N. Chigogidze, and N. P. Khuchua *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 41-42 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 9, Sep. 1984 p 1820-1823 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Intrinsic magnetic field of an electron beam was calculated for later application in relativistic electron devices. An axisymmetric beam was considered and, for simplicity, calculations were for an annular volume element with internal elementary convection current. Vector potential and electron velocity components were transformed from Cartesian to a cylindrical system of coordinates and magnetic induction was established at observation points inside and outside the volume element. The self-consistent problem discretized in space was treated according to electron optics theory and solved by numerical methods, analogously to calculation of intrinsic electrostatic field, with an auxiliary grid for the beam propagation space, assuming space charge and electron velocity distributions to be known. Validity of procedure and algorithms was verified against analytical solutions of two test problems: (1) magnetic field of a long solid or hollow electron beam with uniform current density distribution; (2) magnetic field of long hollow revolving electron beam. The numerical procedure was programmed in FORTRAN for YeS computers. Author

N86-15590# Joint Publications Research Service, Arlington, Va.
INTRINSIC MAGNETIC FIELD OF ELECTRON BEAM Abstract Only **c72**
M. P. Zaft and S. I. Molokovskiy *In* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 41-42 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 9, Sep. 1984 p 1845-1848 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The widening of strong-field domains in Gunn-effect diodes is analyzed on the basis of the Shoji model of electric dipole arrays, when the domain expands transversely simultaneously with longitudinal buildup in direction of electric bis field. The widening

rate (about one order of magnitude higher than electron drift velocity in epitaxial n-GaAs layers) is calculated for the supercritical doping case and is found to increase with increasing electron concentration but less so with increasing layer thickness. In this case linear approximation of the velocity-field characteristics requires three rather than two different straight segments and diffusion current must also be taken into account. Resulting relation indicates feasibility of increasing charge carrier concentration beyond 5 times 10 to the 16th power cm(-3) ceiling imposed by requirement of a current voltage characteristic with sufficiently large current drop.
Author

N86-15591# Joint Publications Research Service, Arlington, Va.
STIMULATED EMISSION OF BOUNDED STRONG-CURRENT ELECTRON BEAM WITH LONGITUDINAL MAGNETIC FIELD MAGNETOSTATIC PUMPING Abstract Only **c72**
V. P. Grigoryev *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 42 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 10, Oct. 1984 p 1977-1984 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The kinetic equation method is employed to analyze stimulated emission of a radius-limited strong relativistic electron beam propagating in a resonant system in the presence of a transverse spatially periodic and a uniform longitudinal external magnetic fields. The field of the emitted wave and the space-charge potential field are represented as eigenfunction expansions of a resonant system, assuming that type H waves, as well as E waves, can be emitted. Stimulated emission is investigated on the basis of a kinetic equation taking the state in a longitudinal magnetic field as the beam steady state. Cyclotron resonance with the pumping wave and the combination wave are investigated. It is found that an external focusing longitudinal magnetic field produces effective stimulated emission when the pumping wave is in resonance with the cyclotron frequency of the electrons in the beam and the focusing field, and when the conditions for cyclotron resonance with the combination wave are satisfied. Author

N86-15592# Joint Publications Research Service, Arlington, Va.
TUBULAR STRONG-CURRENT RELATIVISTIC ELECTRON BEAM INSTABILITY Abstract Only **c72**
O. B. Ovsyannikova, F. F. Kamenets, and V. G. Leyman *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 43 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 10, Oct. 1984 p 1985-1993 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Tubular strong-current beam instability in a vacuum is investigated allowing for the gene region formation conditions which make it necessary to consider the transverse electron relativistic movement. Perturbations disturbing the homogeneity of the beam transverse to the magnetic field are investigated as the most rapidly increasing. The model employed assumes that the beam is an infinitely thin charged surface. Development of such perturbations in beams with finite thickness is analyzed numerically allowing for the influence of the conducting electrode and relativistic transverse movement. The instability is found to depend little upon the distance to the conducting electrode and stability improves significantly as the relativistic factor of the transverse movement is increased by increasing beam current. Author

N86-15593# Joint Publications Research Service, Arlington, Va.
FASTER-THAN-LIGHT SOURCES IN ELECTRON BEAMS Abstract Only **c72**
B. G. Tsikin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 43 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 10, Oct. 1984 p 1994-1997 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

It is demonstrated that a flow of electrons moving over a retarding system and amplifying the surface electromagnetic wave loses some of its energy to the radiation of TEM-waves indicating that faster-than-light radiation sources exist in electron beams if slow current waves with monotonically varying amplitude are excited in them. The effect is caused by the occurrence of faster-than-light Fourier components in the variable component of the current as the amplitude varies. The present effect can be observed when bulk charge density decreases in modulated electron flows. Author

N86-15594# Joint Publications Research Service, Arlington, Va.
ANALYSIS AND IDENTIFICATION OF INERTIAL DEVICES Abstract Only
N. Z. Safiullin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 44-45 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 11, Nov. 1984 p 12-18 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

A hybrid theoretical and experimental model of nonlinear inertial devices is constructed for their identification and analysis such that its complexity does not increase excessively with increasing order of nonlinearity. A continuous and stable nonlinear receiver-amplifier with finite inertia is described by a finite sum of a Volterra series characterizing the response to a bounded input signal. Identification with either a real signal or a special test signal uses a double-trace memory oscilloscope or a stroboscopic unit. Multidimensional pulse response characteristics of a device are plotted in parametric form, most convenient for scanning and analysis. Analytical multiple integration becomes feasible after reduction of the number of unknown parameters. An analytical general expression was derived for the output signal from nonlinear inertial devices with weak oscillatory properties and input signal or arbitrary form. The results of identification and analysis are used for solving the model optimization problem, typically with respect to the mean-square error, including search for its global minimum by such methods as modified random search or complete sorting. Author

N86-15595# Joint Publications Research Service, Arlington, Va.
NEW TYPE OF IMPURITY DEFECTS IN SEMIINSULATING GALLIUM ARSENIDE Abstract Only **c76**
V. V. Voronkov, G. I. Voronkova, V. P. Kalinushkin, D. I. Murin, E. M. Omelyanovskiy, L. Ya. Pervova, A. M. Prokhorov, and V. I. Raykhshteyn *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 46 Transl. into ENGLISH from Fizika i Tekhnika Poluprovodnikov (Leningrad, USSR), v. 18, no. 8, Aug. 1984 p 1363-1366 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The kinetics of the action of millisecond laser pulses on semiconductors are studied, as well as the characteristics of melting, recrystallization and redistribution of impurities associated with the spike nature of laser radiation in the free lasing mode. The studies were performed by reflecting the sounding radiation from the illuminated surface of the crystal. It was found that, when the irradiation conditions are selected optimally, uniformly recrystallized layers with modified physical and mechanical characteristics can be obtained by exposing the specimens to millisecond laser pulses. The influence of segregation effects and impurity evaporation processes on the properties of the recrystallized layers is analyzed. It is found that uniform expitaxial layers with modified impurity distribution by depth can be obtained; millisecond pulsing also makes it possible to clean the crystal surface of absorbed layers and remaining reaction products formed during chemical treatment of the material. Author

N86-15596# Joint Publications Research Service, Arlington, Va.
PICOSECOND PHOTOCONDUCTIVITY OF INDIUM ARSENIDE Abstract Only **c76**
E. Adomaytis, Z. Dobrovolskis, and A. Krotkus *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 46 Transl. into ENGLISH from Fizika i Tekhnika Poluprovodnikov (Leningrad, USSR), v. 18, no. 8, Aug. 1984 p 1422-1424 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Optoelectronic switching in indium arsenide was investigated. Specimens made from an InAs single crystal doped with Cr and Zn, and of an undoped crystal, were prepared. The shape and amplitude of pulses passing through the indium arsenide specimen are examined for different amounts of radiant energy illuminating the specimen. The output signal is not proportional to the conductivity of the specimen. Indium arsenide is found to exhibit some fundamental shortcomings as a semiconductor, including low dark resistance and limited maximum amplitude of the output signal, which restricts its use in optoelectronic switches to the region of small amplitudes. Author

N86-15597# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF RECRYSTALLIZATION AND REDISTRIBUTION OF IMPURITIES IN SEMICONDUCTORS EXPOSED TO MILLISECOND LASER RADIATION Abstract Only c76
S. G. Kiyak, A. K. Shukhostanov, G. V. Savitskiy, S. Zh. Gonov, and V. V. Gafiychuk *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 47 Transl. into ENGLISH from Fizika i Tekhnika Poluprovodnikov (Leningrad, USSR), v. 18, no. 8, Aug. 1984 p 1446-1448 Original language document was announced as N85-26302 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The kinetics of millisecond laser pulses acting upon semiconductors are investigated by reflecting probing radiation from the irradiated surface of the crystal. The characteristics of fusion, recrystallization and impurity redistribution associated with the spike nature of laser radiation in the free lasing mode are investigated. The temporal characteristics of fusion and recrystallization were investigated on germanium specimens by charting the variation in intensity of probing radiation from an LG52-1 helium-neon laser reflected from the surface. The surface layer of the crystals was heated and fused by radiation from a GOS-301 neodymium-laser. It is found that millisecond laser pulses (under optimum conditions) can produce uniformly recrystallized layers with modified physical and mechanical characteristics. The influence of segregation effects and impurity evaporation processes on the properties of the recrystallized layers is discussed. The radiation mode employed can be used to remove adsorbed layers from the crystal surfaces, and to eliminate reaction products formed during chemical treatment of the material. Author (IAA)

N86-15598# Joint Publications Research Service, Arlington, Va.
PRINCIPLES AND PROBLEMS OF BUILDING dc ELECTRIC DRIVES WITH SYMISTOR CONTROL Abstract Only
A. D. Pozdeyev and A. G. Ivanov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 48 Transl. into ENGLISH from Elektrotekhnika (Moscow, USSR), no. 11, Nov. 1984 p 2-6 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Reversible symistor (triac) converters are considered for d.c. electric drives. The main problem is the much lower reliability of symmetric thyristors than that of plain ones, owing to the possibility of spontaneous reversal in the absence of a resolution signal from the switching logic when the device is controlled by unipolar pulses or upon reversal of voltage polarity across the power terminals when the device is controlled by bipolar signals. Spontaneous symistor reversal can be prevented either by limiting the reverse dv/dt to the permissible commutation level or by delaying application of the reverse voltage till after recovery. The latter condition is achieved by means of saturable reactors. The authors propose using a polyphase laminated reactor core, with alternating solid and slit laminations, so as to combine these delaying reactors and the switching reactors with common windings. Two methods of controlling symistors were developed which not only improve their reliability but also reduce the size of such dual reactors involving, respectively, monitoring the point where the counter-emf wave intersects the voltage wave across the switched-off rectifier or monitoring the voltage polarity across the switched-off symistor. Author

N86-15599# Joint Publications Research Service, Arlington, Va.
MODULAR DISTRIBUTOR FOR CONTROLLING GROUP OF ELECTRIC DRIVES Abstract Only
A. I. Parkhomenko, V. I. Koshman, V. F. Petrichenko, V. D. Gorotov, and L. P. Abara *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 50 Transl. into ENGLISH from Elektrotekhnika (Moscow, USSR), no. 11, Nov. 1984 p 14-18 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

A series of modular distributors, RASK, was developed for controlling a group of electric drives in coal mines or other mines, where a large number of contractors must be protectively enclosed. Unlike conventional distributors with three electromagnets for circuit closing, circuit opening, and zero-sequence protection respectively, a RASK distributor has only one main electromagnet for circuit closing. The other two functions are performed by small auxiliary electromagnets, their number being equal to the number of controlled drives and additional contactors being provided for their operation as intermediate relays. Such a distributor not only switches drives on or off, selectively and independently rather than sequentially, but also commutates the arc-quenching circuits. All circuits can be controlled by current signals transmitted over two or three wires, either all or only some controlled circuits to be closed or opened, and all circuits can be opened simultaneously for zero-sequence protection. The advantages of fewer components are appreciable reduction of metal content. Author

N86-15600# Joint Publications Research Service, Arlington, Va.
ELECTRIC DRIVE MOTORS FOR INDUSTRIAL ROBOTS Abstract Only
Klaus Fichtner *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 51 Transl. into ENGLISH from Elektrotekhnika (Moscow), no. 11, Nov. 1984 p 33-35 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

In robotized industrial plants it is possible to use electric motors in the technological process and also for control, assembly, transport, testing, and measurements. Particularly suitable for these applications are permanent-magnet d.c. motors. A new special series was developed for industrial robots with hinge joints in kinematic pairs. The complete drive includes thyristors or transistor controls with regulators and, if necessary, a line transformer as well as a servomotor with tachometer and odometer for speed, current, and position control. The drive is coupled to a robot tong through mechanical torque and force converters. In addition to a 0 to 4000 rpm speed regulation, without wobble at low speeds, and a high torque-to-weight ratio for repetitive short-time heavy duty, these low-inertia motors develop high starting and accelerating torques over the entire speed range. They operate from a 1 to O 220 V a.c. line through a rectifier. The motors are totally enclosed, or of open construction for better ventilation. Their windings have class F insulation for operation at ambient temperatures up to 40 C. Author

N86-15601# Joint Publications Research Service, Arlington, Va.
TWO-STEP PULSE TRIGGERING OF DYNISTOR POWER SWITCHES Abstract Only
A. V. Gorbatyuk, I. V. Grekhov, and S. V. Korotkov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 51-52 Transl. into ENGLISH from Elektrotekhnika (Moscow, USSR), no. 11, Nov. 1984 p 42-46 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The performance of reversibly switching power dynistors is examined on the basis of physical processes which occur in their structure to determine their dv/dt and di/dt characteristics. Conditions for normal and most efficient operation are established by qualitative and quantiative analysis of available data. Pulse triggering of these thyristor-diode devices is considered, a particularly important parameter here being the lifetime of the high-conductance phase in internal p-N-n(+) diode segments from reverse injection till flow of positive anode current (reverse diode current). The length of this period is calculated according to the

conventional simple theory of diffusion with charge storage, which is applied here to a semiinfinite model structure and the transient state with arbitrary waveforms of forward and reverse diode currents. The corresponding equation of ambipolar diffusion is solved for appropriate initial and boundary conditions for the hole concentration and its rate of change. A comparative evaluation of single-step and two-step triggering reveals the advantages of the latter mode with simultaneous uniform injection of initially induced charge. Author

N86-15602# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL DETERMINATION OF TURN-OFF TIME OF HIGH-VOLTAGE POWER THYRISTORS Abstract Only
G. V. Grigoryeva, A. V. Konyukhov, V. A. Kuzmin, and Yu. A. Chesnokov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 52 Transl. into ENGLISH from Elektrotekhnika (Moscow, USSR), no. 11, Nov. 1984 p 50-53 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Silicon power thyristors were studied to determine the dependence of their turn-off time on the repetitive reverse voltage, on the rate of decrease of the forward current and on the lifetime of holes. Three groups of thyristors were tested corresponding to T630, T173-1250, T353-800 four-layer devices rated for 2400 to 2800 V, 2600 to 2800 V, 2800 to 3200 V respectively. The data are evaluated and the dynamics of charge buildup and dissipation during reversals of anode voltage polarity are considered. Significant differences in turn-off characteristics between the three groups of thyristors are shown. It decrease in the life of holes for minimum turn-off time and thus maximum switching speed involves a tradeoff with a higher blocking-state pulse voltage and larger leakage currents is indicated. E.A.K.

N86-15603# Joint Publications Research Service, Arlington, Va.
RECOMMENDATIONS FOR DEVELOPING SIMULATORS OF SOLAR RADIATION PENETRATING TO THE EARTH'S SURFACE Abstract Only **c35**
F. K. Maslovets *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 53 Transl. into ENGLISH from Elektrotekhnika (Moscow, USSR), no. 12, Dec. 1984 p 46-48 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

By irradiation of materials provides a possibility of producing processes not characteristics of the natural solar radiation and intensification of other processes can also occur. Tests were conducted to obtain a total intensity of simulated solar radiation of 1.6 to 1.8 cal/(sq. cm. min), where 0.06 cal/(sq. cm. min.) lie in the ultraviolet region (0.28-0.4 micrometer), or, based on the photochemical activity, 5.4-5.5 mg/sq. cm .h of decomposed oxalic acid at the chamber temperature of 80 C for an hour exposure. The radiation intensity was measured at each corner of a 500x500 sq mm area for three different elevations. It is indicated that the test objectives are satisfied for the elevation of 600 to 700 mm from the chamber bottom. Author

N86-15604# Joint Publications Research Service, Arlington, Va.
MEASURING RADIATION ELECTROCONDUCTIVITY OF SOLID DIELECTRICS EXPOSED TO PULSED IONIZING RADIATION Abstract Only **c74**
S. N. Makeyev and O. I. Shmid *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 54-55 Transl. into ENGLISH from Elektrotekhnika (Moscow, USSR), no. 12, Dec. 1984 p 48-51 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Radiation electroconductivity (REC) is one of the fundamental parameters which describes the behavior of dielectric materials and metal-dielectric systems in a field of ionizing radiation. The development of improved methods for measuring this parameter are described. The work done on measuring the radiation electroconductivity of solid dielectrics and metal-dielectric semiconductors (MDS) under the impact of ionizing radiation pulses in the 2000-0.03 micron range is summarized. The existing methods are based on measuring the voltage across a reference resistor carrying current, which depends on the resistance of the sample and the externally applied voltage. A new method for measuring the REC under pulsed radiation in the 0.26-2600 kCl/kg gamma radiation energy range allows to reduce the level of induced voltage to a value not greater than 20 mV. Under conditions of pulsed gamma-neutron radiation an additional pulse appears at the leading edge of the conductivity signal. Electret charges, responsible for the polarization effects with pulsed gamma radiation are stored in the dielectric material of the measuring cell and in the measuring line. E.A.K.

N86-15605# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF AUTOMATED LIGHT GUIDE PULSE DISPERSION MEASUREMENT Abstract Only
T. V. Babkina, V. V. Gruzoryants, S. V. Kuryuzhin, I. Ye. Nefedov, G. A. Malakhova, A. Ya. Oleynikov, Ye. V. Pankrats, A. Ya. Smirnov, and M. A. Khaldina *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 54 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 10, Oct. 1984 p 2033-2038 Original language document was announced in IAA as A85-14798 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The use of a stroboscopic set up employing CAMAC hardware for measuring pulse dispersion in fiber-optic waveguides is described, and a block diagram of the automated setup is presented. It is shown that this instrumentation produces an order-of-magnitude reduction in the time required for the experiment and improves accuracy by the statistical processing of the experimental data. The measurement accuracy of the waveguide passband is 5% at a 0.5 level in the 1-Ghz band for a wavelength of 0.85 micron. B.J. (IAA)

N86-15606# Joint Publications Research Service, Arlington, Va.
INTERNAL CONDITIONS FOR SELF EXCITATION OF SUPERCONDUCTOR DC GENERATORS Abstract Only
B. L. Aliyevskiy *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 57 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Elektromekhanika (Novocherkassk, USSR), no. 11, Nov. 1984 p 24-30 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Relationships were developed for self-contained dc generators describing the conditions for the self-excitation in the case of parallel and series connections of the inductor winding made of the type 2 superconductor. The Hurwitz stability criteria were applied for the analysis of equations describing the electromagnetic process, and the conditions for the existence and stability of the mode which would be established after the excitation. The validity of the method was verified experimentally using results obtained for similar phenomena with conventional dc generators. Author

N86-15607# Joint Publications Research Service, Arlington, Va.
EFFECT OF CONDUCTOR PROFILE ON FORCE CHARACTERISTICS DUE TO MOTION OF A MAGNETIC FIELD SOURCE Abstract Only **c70**
V. I. Astakhov and M. V. Bondarenko *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 57-58 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Elektromekhanika (Novocherkassk, USSR), no. 11, Nov. 1984 p 8-12 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Algorithms were developed for computing the lift, lateral, and braking forces acting on a source of a magnetic field moving along a conductor with complex profile. Numerical values of the acting forces were obtained for a rectangular configuration and different bend angles of the current conductor. Computations indicated that with an increased angle of the conductor bend phi, or an increased curvature K, the characteristics of the electrodynamic suspension system became worse. E.A.K.

N86-15608# Joint Publications Research Service, Arlington, Va.
STRIP AND MICROSTRIP LINE PERIODIC HETEROGENEITIES Abstract Only
A. M. Lerer, B. M. Lerer, V. D. Ryazanov, and V. A. Sledkov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 59 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 10, Oct. 1984 p 1877-1886 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

A quasistatic method is described for analyzing periodic heterogeneities in single and coupled strip lines and microstrip lines. An ALGOL program on a BESM-6 computer calculated the running inductance and capacitance, wave impedances and delay coefficients for single and coupled strip lines and microstrip lines with periodic heterogeneities of arbitrary form. The analyzed quantities are investigated as a function of distance (from side shield to the strip), number of terms in the series and number of approximated functions. The method demonstrates good convergence and requires little machine time and results were verified experimentally. E.A.K.

N86-15609# Joint Publications Research Service, Arlington, Va.
THIN-FILM BOLOMETER POWER TRANSDUCE ELECTRODYNAMIC ANALYSIS AND EXPERIMENTAL INVESTIGATION Abstract Only
Kh. L. Garb, P. V. Nikolayev, P. Sh. Fridberg, and I. M. Yakover *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 59 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 10, Oct. 1984 p 1917-1926 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

A bolometric power transducer consisting of metal holders and thin resistor film in a single-mode rectangular waveguide is examined and a system of integral vector equations for surface currents on the transducer element is derived and solved by Galerkin's method. Asymptotic methods are derived for equivalent circuit shunt impedance and a method is described for calculating matrix elements containing slowly converging dual series. The frequency behavior of quantities mod S11 and Mod S21 is investigated for the heterogeneity represented by metal holders and resistive film. It is confirmed that the model of a holder with thickness of 0 is valid. E.A.K.

N86-15610# Joint Publications Research Service, Arlington, Va.
POWER COMBINATIONS MICROWAVE AMPLIFIER LOADING CHARACTERISTICS Abstract Only
V. V. Zayentsev and M. A. Minkin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 60 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 10, Oct. 1984 p 1966-1970 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Improvements in loading properties of amplifiers in combination with the power from an arbitrary number of amplifiers based on noncoherent adders with relatively small phase shift were studied. Loading properties are described with the ratio of the power output by the system into an unmatched load to matched condition power. It is found that multichannel noncoherent channel adders with phase difference of pi/n at the low end of the working frequency band allow effective compensation for input reflections and improve amplifier loading properties. E.A.K.

N86-15611# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF HIGHER TYPES OF OSCILLATIONS ON PISTON-TUNED WAVEGUIDE GUNN OSCILLATOR FREQUENCY Abstract Only **c32**
A. A. Litsov, D. A. Usanov, B. P. Bezruchko, and A. Yu. Vagarin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 60 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow), v. 29, no. 10, Oct. 1984 p 2057-2058 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The influence of higher types of oscillations on the piston-tuned waveguide Gunn oscillator frequency was investigated. Diode loaded impedance is investigated for the case of higher types of oscillations existing near holder and interacting between holer and piston only in terms of the basic type of H10, and for the case of interaction between the piston and holder in terms of the basic and attenuating higher types of oscillation. Calculated and experimental frequency behavior are found to agree sufficiently well but it is essential to allow for interaction of higher types of oscillations to explain the nature of the relationship between Gunn oscillator frequency and the position of the shorting piston when the distances between the holder and piston are sufficiently small. E.A.K.

N86-15612# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF ELLIPTICAL WAVEGUIDES IN CYLINDRICAL REFERENCE BASIS Abstract Only **c32**
G. I. Veselov and N. I. Platonov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 61 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 11, Nov. 1984 p 64-67 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Analysis of elliptical waveguides and determination of their eigenfunctions by the classical method of coordinate surfaces and angularly periodic Mathieu functions in an elliptical system of coordinates is cumbersome. A simpler method of solving the problem of electrodynamics is generalized separation of variables in a cylindrical system of coordinates, which yields series of circular cylindrical waves which satisfy the corresponding homogeneous Helmholtz equation and are periodic with respect to the angular coordinate. This method is applied here to an ideal elliptical waveguide with a homogeneous filler occupying the entire cavity and to a coaxial elliptical waveguide with a tubular filler. In an elliptical reference basis the eigenfunctions of both waveguides would appear in closed form. Determination of eigenfunctions for the corresponding simply connected region reduces to solving a homogeneous system of linear algebraic equations. DOE

N86-15613# Joint Publications Research Service, Arlington, Va.
PHOTOGRAPHIC RECORDING OF TRAJECTORIES OF AEROSOL PARTICLES BY METHOD OF MULTIPLE EXPOSURE Abstract Only **c35**
N. S. Mikhovich, B. I. Petrov, and Yu. P. Toporov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 65 Transl. into ENGLISH from Zhurnal Nauchnoy i Prikladnoy Potografii i Kinematografii (Moscow, USSR), v. 29, no. 6, Nov. - Dec. 1984 p 409-413 Original language document was announced in IAA as A85-18300 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

A device using a pulsed-lamp light source has been developed for the photographic recording of the trajectories of rapidly moving aerosol particles. The recording of an aerosol stream is carried out by the illumination of the stream with a packet of light pulses of given frequency and duration, which makes it possible to obtain the particle velocity distribution. The device can measure a minimum particle size of 10 microns for an aerosol stream velocity up to 25 m/s. The electronic circuit for the power supply and control of the ISP-70 lamp is described. B.J. (IAA)

N86-15614# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF REVERSE BRANCH OF VOLTAGE-CURRENT CURVE OF GaAs HIGH-VOLTAGE p-n STRUCTURE Abstract Only
V. I. Korolkov, R. S. Osipova, S. I. Ponomarve, M. N. Stepanova, and G. I. Tsvilev *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 68 Transl. into ENGLISH from Fizika i Tekhnika Poluprovodnikov (Leningrad, USSR), v. 18, no. 11, Nov. 1984 p 2029-2035 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The temperature behavior of the reverse branches of the

voltage-current curves of p-n junctions based on lightly doped gallium arsenide, capable of operating with reverse voltages of up to 1.5 kV and at temperatures of up to 250C, was investigated. The volumetric component of the reverse current was measured by a guard ring at temperatures ranging from 20 to 250C and voltages of 2 to 1500 V. The measured volumetric component of the reverse current disagreed with that predicted by the Shockley-Noyce-Sah theory, which assumes that the rate at which electron-hole pairs is generated is independent of the electrical field intensity. It is shown that this assumption does not always hold when the rate of emission of charge carriers depends strongly upon the field. It is conducted that the anomalies observed in the field and temperature behavior of the reverse current of p-n junctions in lightly doped gallium arsenide can be explained by the field dependence of the rate of emission of electrons from deep levels. E.A.K.

N86-15615# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF EMBEDDED ELECTRICAL FIELDS ON TEMPERATURE STABILITY OF PARAMETERS OF I-Ga-As HETEROPHOTOELEMENTS Abstract Only
A. M. Allakhverdiyev, V. M. Andreyev, N. B. Dzhelepova, B.V. Yegorov, and O. V. Sulima *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 69 Transl. into ENGLISH from Fizika i Tekhnika Poluprovodnikov (Leningrad, USSR), v. 18, no. 11, Nov. 1984 p 1979-1984 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The saturation current I sub o and idling voltage U sub xx in heterophotoelements employed in high-efficiency solar concentrators are examined to determine the influence of embedded elongated electrical fields caused by hole concentration gradients. It is found that the temperature variation in U sub xx is less when the field is present than when it is absent. The element with the best temperature stability is an Al sub 0.14 Ga sub 0.86 As p-n-junction element with a thin diffusion p-region and large hole concentration gradient obtained by liquid film epitaxy and diffusion of zinc from the vapor phase. At elevated working temperatures, AlxGa sub 1- sub (x) sub As p-n-junction photoelements with strong embedded elongated electrical fields are preferred. E.A.K.

N86-15616# Joint Publications Research Service, Arlington, Va.
HIGH-FREQUENCY CHARACTERISTICS OF BALLISTIC BIPOLAR HETEROJUNCTION TRANSISTORS Abstract Only
V. I. Ryzhiy and V. A. Fedirko *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 69-70 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 11, Nov. 1984 p 2250-2256 Original language document was announced in IAA as A85-15692 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The HF characteristics of bipolar transistors based on semiconductor heterostructures are calculated and analyzed. It is suggested that, for n-p-n transistors, the motion of electrons in the base and collector junction is ballistic, while the high conductivity of the base assures its quasineutrality. Allowance is made for the nonquadratic character of the electron dispersion law, significant in the collector-junction region. Frequency dependences of the current gain coefficients are determined for a circuit with a common base and emitter, and boundary frequencies are determined.
B.J. (IAA)

N86-15617# Joint Publications Research Service, Arlington, Va.
SENSITIVITY OF SQUIDS BUILT WITH LOW-CAPACITANCE JOSEPHSON TUNNEL JUNCTIONS Abstract Only
A. B. Zorin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 70 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow), v. 29, no. 11, Nov. 1984 p 2224-2233 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The dynamic characteristics of squids built with a single low-capacitance Josephson tunnel junction or with two such junctions are analyzed. A low-inductance interferometer ring is assumed. Relations are derived by the microscopic theory, which agrees with the resistive model at temperatures lower than half the critical and at frequencies much lower than the energy-gap frequency. The resolving power and the energy yield sensitivity of such squids are calculated and low-frequency fluctuation noise and the squid reaction on the signal source are considered. E.A.K.

N86-15618# Joint Publications Research Service, Arlington, Va.
EXTERNAL LOCKING OF IMPATT-DIODE POWER OSCILLATORS Abstract Only
Ye. M. Gershenzon, A. A. Levites, L. A. Plokhova, and A. I. Smetanin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 70-71 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 11, Nov. 1984 p 2179-2185 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

A single-stage oscillator with nonlinear delay in the feedback loop is analyzed for locking by an external signal. The results are applied to silicon IMPATT-diode oscillators. Calculations are based on the equivalent circuit with three voltage generators in series which are produced in the: hole transit region, the electron transit region, and compensate the field difference between the real p-n junction and the equivalent multiplier layer. Amplitude-frequency phase-frequency, power-frequency characteristics and the dependence of the locking band on the load are determined. The latter is characterized by the ratio of starting current to diode supply current and the amplitude dependence of the delay angle and the frequency dependence on the diode resistance is considered. It is indicated that the oscillator performance droops only slightly in the range of load ratios lower than optimum but droops appreciably in the range of load ratio higher than optimum. In the latter case reconciliation of theoretical data with experimental data requires a more precise and intricate equivalent circuit. E.A.K.

N86-15619# Joint Publications Research Service, Arlington, Va.
MAXIMUM ATTAINABLE SENSITIVITY OF dc SQUIDS BUILT WITH JOSEPHSON TUNNEL JUNCTIONS Abstract Only
O. V. Snigirev *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UES-85-006) 30 Apr. 1985 p 71 Transl. into ENGLISH from Radiotekhnika i Elektronia (Moscow, USSR), v. 29, no. 11, Nov. 1984 p 2216-2223 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The performance of dc squids built with Josephson tunnel junctions is analyzed for the ideal equivalent circuit with the junctions unshunted and for the fundamental relation according to which a variation of the magnetic flux produces a change in the critical current and consequently a variation of the high-frequency component of the voltage signal, the low-frequency component of the voltage signal is passed by a narrow-band filter. The dynamic characteristics of a low-inductance interferometer, analogous to those of a single Josephson tunnel junction, are calculated first for a device without noise. They are then calculated for a device with fluctuation noise, the effect of the latter depending largely on the ratio of fluctuation intensity to rate of current buildup. A lower bound is established for the energy sensitivity of the device, this lower bound is found to be much higher with high-frequency pumping near the upper frequency limit and not much different than that for a conventional squid with shunted Josephson tunnel junctions. E.A.K.

N86-15620# Joint Publications Research Service, Arlington, Va.
STANDARDIZATION OF SCHWARZ-CHRISTOFFEL TRANSFORMATION FOR ENGINEERING DESIGN OF SEMICONDUCTOR AND HYBRID INTEGRATED-CIRCUIT ELEMENTS Abstract Only
A. A. Yashin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 72 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 11, Nov. 1984 p 55-57 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

A semiconductor or hybrid structure into a calculable two-dimensional region mapped by the Schwarz-Christoffel transformation and a universal algorithm can be constructed on the basis of Maxwell's electro-magnetic-thermal similarity principle for engineering design of integrated-circuit elements. The design procedure involves conformal mapping of the original region into a polygon and then the latter into a rectangle with uniform field distribution, where conductances and capacitances are calculated, using tabulated standard mapping functions. Subsequent synthesis of a device requires inverse conformal mapping. Devices adaptable as integrated-circuit elements are high-resistance film resistors with periodic serration, distributed-resistance film attenuators with high transformation ratio, coplanar microstrip lines, bipolar transistors, directional couplers with distributed coupling to microstrip lines for microwave bulk devices, and quasirregular smooth matching transitions from asymmetric to coplanar microstrip lines. E.A.K.

N86-15621# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL INVESTIGATION OF ACOUSTIC WAVE ELECTRICAL EXCITATION IN ELECTROLYTE SOLUTION Abstract Only **c71**
A. N. Malakhov and V. V. Cherepennikov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 73 Transl. into ENGLISH from izvestiya Vysshikh Uchebnykh Zavedeniy: Radiofizika (Gorkiy, USSR), v. 27, no. 10, Oct. 1984 p 1349-1352 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

The electrical excitation of acoustic oscillations in an electrolyte solution in a rectangular container was investigated. A solution of sodium chloride was employed with a radiator consisting of a metal grid of steel wires 3.3 mm in diameter. An equation is derived for vibrational velocity potential and is solved for a rectangular container with no initial conditions, rigid boundaries and free surface obtained by the Fourier method. Predicted and experimental values agree satisfactorily. The use of a wire grid radiator is suggested for creating standard hydroacoustic fields to be used for calibrating hydroacoustic sensors. E.A.K.

N86-15622# Joint Publications Research Service, Arlington, Va.
ACOUSTOOPTIC DEMODULATOR OF PHASE-KEYED SIGNALS Abstract Only **c32**
A. V. Pugovkin, V. A. Krakovskiy, and G. A. Kolchina *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 73-74 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 11, Nov. 1984 p 2266-2268 Original language document was announced in IAA as A85-15694 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

Theoretical and experimental results are presented on an acoustooptic (AO) demodulator of PSK signals based on an AO processor. The passage of the phase surge through the AO modulator is analyzed. It is shown that, in order to achieve significant band broadening and a uniform frequency-response curve, it is necessary to reduce the laser-beam aperture and to use spatial filters that exclude the region of spatial frequencies alpha less than 0.5. B.J. (IAA)

N86-15437# Joint Publications Research Service, Arlington, Va.
FUJI, THOMSON TO DEVELOP, PRODUCE HIGH-POWERED TRANSISTORS
P. DeVittor *In its* West Europe Report: Science and Technology p 53-57 Transl. into ENGLISH from Elettronica Oggi (Milan), May 1985 p 117-122 (For primary document see N86-15435 06-31)
Avail: NTIS HC A04/MF A01

N86-15441# Joint Publications Research Service, Arlington, Va.
MICRO-POWER DISSIPATION DEVICE DESCRIBED
Mao Xingwu, Zhou Likai, and Zhou Jianjun *In its* China Report: Science and Technology (JPRS-CST-85-038) 5 Nov. 1985 p 51-56 Transl. into ENGLISH from Dianzi Rexue Jishu (Beijing), v. 15, no. 3, 10 Mar. 1985 p 24-26 (For primary document see N86-15438 06-31)
Avail: NTIS HC A06/MF A01

N86-15467# Joint Publications Research Service, Arlington, Va.
ACTIVE MICROWAVE FILTERS Abstract Only
B. Yu. Kapilevich *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 62 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 1, Jan. 1985 p 3-10 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

N86-15468# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF TRANSIENTS IN DIRECT CURRENT CABLE INSULATION Abstract Only
M. Yu. Shuvalov, S. Ye. Gleyzer, and E. T. Larina *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 79 Transl. into ENGLISH from Elektrichestvo (Moscow, USSR), no. 3, Mar. 1985 p 49-52 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

N86-15476# Joint Publications Research Service, Arlington, Va.
GDR SCIENTISTS DEVELOP ELECTROLUMINESCENCE DISPLAY
Christian Waldner *In its* East Europe Report: Science and Technology (JPRS-ESA-85-033) 5 Nov. 1985 p 21-22 Transl. into ENGLISH from Volksstimme (Magdeburg, East Germany), 20 Jun. 1985 p 4 (For primary document see N86-15473 06-31)
Avail: NTIS HC A04/MF A01

N86-15481# Joint Publications Research Service, Arlington, Va.
NOVEL CONTROL CIRCUIT FOR PROXIMITY FOCUSED MICROCHANNEL PLATE IMAGE INTENSIFIERS
Zhou Xuan *In its* China Report: Science and Technology (JPRS-CST-85-040) 20 Nov. 1985 p 33-44 refs Transl. into ENGLISH from Dianzi Kexue Xuekan (Beijing, China), v. 6, no. 6, Nov. 1984 p 473-480 (For primary document see N86-15478 06-31)
Avail: NTIS HC A06/MF A01

N86-15485# Joint Publications Research Service, Arlington, Va.
SURFACE PASSIVATION OF SEMICONDUCTOR CIRCUIT ELEMENTS WITH LAYER OF WIDEBAND SEMICONDUCTOR Abstract Only
B. I. Sysoyev, N. N. Bezryakin, A. S. Dronov, and A. P. Rovinskiy *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 2-3 Transl. into ENGLISH from Mikroelektronika (Moscow, USSR), v. 14, no. 2, Mar. - Apr. 1985 p 140-143 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15486# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF ELECTROPHYSICAL AND PHOTOELECTRIC PROPERTIES OF MOS-STRUCTURES ON INDIUM ARSENIDE Abstract Only
Ye. A. Loskutova, V. N. Davydov, and T. D. Lezina *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 3-4 Transl. into ENGLISH from Mikroelektronika (Moscow, USSR), v. 14, no. 2, Mar. - Apr. 1985 p 134-139 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15487# Joint Publications Research Service, Arlington, Va.
PREDICTING AND DIAGNOSING PERFORMANCE OF TRANSISTORS, INTEGRATED CIRCUITS AND LARGE-SCALE-INTEGRATION SYSTEMS BY MULTILEVEL SIMULATION METHODS AND PROGRAMS Abstract Only
A. N. Bubennikov, B. N. Mitashev, and A. D. Sadovnikov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 5 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 3, Mar. 1985 p 3-7 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15488# Joint Publications Research Service, Arlington, Va.
NONSINUSOIDAL MODES OF OSCILLATOR WITH MULTIFREQUENCY SURFACE-ACOUSTIC-WAVE RESONATOR Abstract Only
G. L. Gurevich, L. N. Zhizhenkova, V. M. Pashkin, and A. M. Spasyuk *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 6 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 30, no. 3, Mar. 1985 p 604-611 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15489# Joint Publications Research Service, Arlington, Va.
NOISE CHARACTERISTICS OF STROBOSCOPIC TRANSDUCERS BUILT WITH GaAs MICROCIRCUIT INTEGRATION Abstract Only
V. I. Staroselskiy *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 7-8 Transl. into ENGLISH from Mikroelektronika (Moscow, USSR), v. 14, no. 2, Mar. - Apr. 1985 p 162-168 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15490# Joint Publications Research Service, Arlington, Va.
STRUCTURAL TRANSFORMATIONS IN SEMICONDUCTORS DURING OPTICAL PUMPING Abstract Only
Yu. V. Kopayev, V. v. Menyaylenko, and S. N. Molotkov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 8-9 Transl. into ENGLISH from Mikroelektronika (Moscow, USSR), v. 14, no. 2, Mar. - Apr. 1985 p 153-161 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15491# Joint Publications Research Service, Arlington, Va.
METHODOLOGY FOR DETERMINING DYNAMIC CHARACTERISTICS OF TRISTABLE-LOGIC INTEGRATED CIRCUITS Abstract Only
A. M. Pashayev and A. R. Adzhalov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 9 Transl. into ENGLISH from Mikroelektronika (Moscow, USSR), v. 14, no. 2, Mar. - Apr. 1985 p 169-170 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15492# Joint Publications Research Service, Arlington, Va.
REDUCING DYNAMIC ERRORS OF INTEGRATED-CIRCUIT CMOS SWITCHES Abstract Only
A. A. Danilov and D. Ye. Polonnikov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 10 Transl. into ENGLISH from Mikroelektronika (Moscow, USSR), v. 14, no. 2, Mar. - Apr. 1985 p 178-179 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15497# Joint Publications Research Service, Arlington, Va.
FREQUENCY CHARACTERISTICS OF DIFFERENTIAL OPTRON Abstract Only
A. K. Mamedov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 25 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 3, Mar. 1985 p 76-78 Original language document was announced in IAA as A85-34176 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15502# Joint Publications Research Service, Arlington, Va.
ACTIVE MAGNETIC SUSPENSION IN MAIN MAGNETIC FIELD OF ELECTRIC MOTOR Abstract Only
I. D. Urusov, V. I. Galkin, and I. P. Likhoshvay *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 50 Transl. into ENGLISH from Elektrotekhnika (Moscow, USSR), no. 3, Mar. 1985 p 38-41 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15505# Joint Publications Research Service, Arlington, Va.
PULSE-TYPE VOLTAGE STABILIZER WITH INTEGRAL PULSE-WIDTH MODULATION Abstract Only
I. A. Fedorova, A. P. Kuznetsov, and L. Yu. Shilin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 55-56 Transl. into ENGLISH from Elektrichestvo (Moscow, USSR), no. 4, Apr. 1985 p 60-61 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15930# Joint Publications Research Service, Arlington, Va.
MICROELECTRONICS TECHNOLOGY
M. Sidorovyy *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 16-24 Transl. into ENGLISH from Znaniye-Sila (Moscow), no. 4, Apr. 1985 p 2-5 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N86-15623 British Library Lending Div., Boston Spa (England).
THE MOVEMENT OF A CLUSTER OF PARTICLES SUBJECT TO THE EFFECT OF GRAVITY AND THEIR SEDIMENTATION ONTO A PLANE HORIZONTAL SURFACE
G. M. Makhviladze and O. I. Melilhov [1985] 15 p refs Transl. into ENGLISH from Mekhanika Zhidkosti i Gaza (Moscow, USSR), no. 6, 1982 p 64-73
(BLL-Risley-Tr-5161-(9091.9F)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

A numerical investigation, on the basis of nonstationary two-dimensional equations of the mechanics of heterogeneous media, into the movement mechanisms of a cloud of particles subject to the effect of gravity in an unbounded medium, and into the interaction of the descending cluster of particles with a plane horizontal surface is reported. According to the degree of hydrodynamic interaction between the particles, various conditions of movement are discerned of the cloud which is settling, and the change in its spatial configuration is traced, which is determined by the large-scale vortical movement of the carrier medium which develops. Distributions are obtained of the concentrations of particles on the sedimentation surfaces. A dispersion coefficient for the cluster of particles on the plane horizontal surface is introduced, and its relationship with the concentration of the particles, with their size and with other parameters is examined.
E.A.K.

N86-15624 British Library Lending Div., Boston Spa (England).
RESEARCH INTO HEAT TRANSFER BY CONVECTION IN THE CHAMBER OF A FURNACE WITH RELATION TO THE ANGLE AT WHICH A HIGH VELOCITY JET STRIKES A PLANE SURFACE
P. G. Krasnokutskii, V. A. Krivandin, A. V. Shpernyi, and G. M. Podolyako [1985] 7 p refs Transl. into ENGLISH from a Russian source
(BLLD-M-36478-(5828.4)) Copyright. Avail: Issuing Activity

Heat transfer between high velocity jets in furnace chambers and flat metal surfaces was investigated. Equations are given for calculating heat transfer from jet to metal with differnt nozzle-surface distances and jet angles of attack. The criterial relationships make it possible to calculate the heat transfer by convection in furnace chambers.
E.A.K.

N86-15625*# Arizona State Univ., Tempe.
HEAT TRANSFER CHARACTERISTICS WITHIN AN ARRAY OF IMPINGING JETS. EFFECTS OF CROSSFLOW TEMPERATURE RELATIVE TO JET TEMPERATURE Final Report
L. W. Florschuetz and C. C. Su Washington NASA Oct. 1985

175 p refs
(Grant NsG-3075)
(NASA-CR-3936; E-2696; NAS 1.26:3936; CR-R-R85020) Avail: NTIS HC A08/MF A01 CSCL 20D

Spanwise average heat fluxes, resolved in the streamwise direction to one stream-wise hole spacing were measured for two-dimensional arrays of circular air jets impinging on a heat transfer surface parallel to the jet orifice plate. The jet flow, after impingement, was constrained to exit in a single direction along the channel formed by the jet orifice plate and heat transfer surface. The crossflow originated from the jets following impingement and an initial crossflow was present that approached the array through an upstream extension of the channel. The regional average heat fluxes are considered as a function of parameters associated with corresponding individual spanwise rows within the array. A linear superposition model was employed to formulate appropriate governing parameters for the individual row domain. The effects of flow history upstream of an individual row domain are also considered. The results are formulated in terms of individual spanwise row parameters. A corresponding set of streamwise resolved heat transfer characteristics formulated in terms of flow and geometric parameters characterizing the overall arrays is described. E.A.K.

N86-15626*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
COMPUTATIONAL FLUID DYNAMICS AT NASA AMES AND THE NUMERICAL AERODYNAMIC SIMULATION PROGRAM
Victor L. Peterson Sep. 1985 23 p refs
(NASA-TM-86769; Rept-85321; NAS 1.15:86769) Avail: NTIS HC A02/MF A01 CSCL 20D

Computers are playing an increasingly important role in the field of aerodynamics such as that they now serve as a major complement to wind tunnels in aerospace research and development. Factors pacing advances in computational aerodynamics are identified, including the amount of computational power required to take the next major step in the discipline. The four main areas of computational aerodynamics research at NASA Ames Research Center which are directed toward extending the state of the art are identified and discussed. Example results obtained from approximate forms of the governing equations are presented and discussed, both in the context of levels of computer power required and the degree to which they either further the frontiers of research or apply to programs of practical importance. Finally, the Numerical Aerodynamic Simulation Program--with its 1988 target of achieving a sustained computational rate of 1 billion floating-point operations per second--is discussed in terms of its goals, status, and its projected effect on the future of computational aerodynamics.
Author

N86-15627*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NUMERICAL SIMULATION OF VISCOUS SUPERSONIC FLOW OVER A GENERIC FIGHTER CONFIGURATION
Denny S. Chaussee, Gordon Blum (Boeing Co., Seattle, Wash.), and John Wai (Boeing Co., Seattle, Wash.) Dec. 1985 10 p refs
(NASA-TM-86823; A-85436; NAS 1.15:86823) Avail: NTIS HC A02/MF A01 CSCL 20D

A procedure is presented, as well as some results, to calculate the flow over a generic fighter configuration. A parabolized marching Navier-Stokes code is used to obtain the solution over a wing-canopy body. The flow conditions simulate supersonic cruise with a freestream Mach number of 2.169 and angles of attack of 4 and 10 deg. The body surface is considered to be an adiabatic wall and the flow is assumed to be turbulent for the given Reynolds number. Author

N86-15628*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TAYLOR-GOERTLER INSTABILITIES OF TOLLMIEN-SCHLICHTING WAVES AND OTHER FLOWS GOVERNED BY THE INTERACTIVE BOUNDARY LAYER EQUATIONS Final Report
Philip Hall Oct. 1985 30 p refs Submitted for publication
(Contract NAS1-17070)
(NASA-CR-178010; ICASE-85-47; NAS 1.26:178010) Avail: NTIS HC A03/MF A01 CSCL 20D

The Taylor-Gortler vortex instability equations are formulated for steady and unsteady interacting boundary layer flows of the type which arise in triple-deck theory. The effective Gortler number is shown to be a function of the all shape in the boundary layer and the possibility of both steady and unsteady Taylor-Gortler modes exists. As an example the steady flow in a symmetrically constricted channel is considered and it is shown that unstable Gortler vortices exist before the boundary layers at the wall develop the Goldstein singularity. As an example of an unsteady spatially varying basic state the instability of high frequency large amplitude Tollmien-Schlichting waves in a curved channel were considered. It is shown that they are unstable in the first Stokes layer stage of the hierarchy of nonlinear states. The Tollmien-Schlichting waves are shown to be unstable in the presence of both convex and concave curvature. Author

N86-15629*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INSTABILITY OF TIME-PERIODIC FLOWS Final Report
Philip Hall (Exeter Univ., England) Oct. 1985 32 p refs Submitted for publication
(Contract NAS1-17070)
(NASA-CR-178009; ICASE-85-46; NAS 1.26:178009) Avail: NTIS HC A03/MF A01 CSCL 20D

The instabilities of some spatially and/or time-periodic flows are discussed, in particular, flows with curved streamlines which can support Taylor-Gortler vortices are described in detail. The simplest flow where this type of instability can occur is that due to the torsional oscillations of an infinitely long circular cylinder. For more complicated spatially varying time-periodic flows, a similar type of instability can occur and is spatially localized near the most unstable positions. When nonlinear effects are considered it is found that the instability modifies the steady streaming boundary layer induced by the oscillatory motion. It is shown that a rapidly rotating cylinder in a uniform flow is susceptible to a related type of instability; the appropriate stability equations are shown to be identical to those which govern the instability of a boussinesq fluid of Prandtl number unity heated time periodically from below.
Author

N86-15630# Naval Underwater Systems Center, New London, Conn.
HYDRODYNAMIC NOISE AND SURFACE COMPLIANCE--AN OVERVIEW OF THE NAVAL UNDERWATER SYSTEMS CENTER IR/IED PROGRAM
H. Bakewell, Jr. and W. A. VonWinkle 15 May 1985 38 p
(AD-A157799; NUSC/TM-851080) Avail: NTIS HC A03/MF A01 CSCL 20/4

This Independent Research and exploratory development program on compliant surfaces is investigating turbulent flows over compliant layers to determine whether a class or classes of such layers can be devised for control and reduction of hydrodynamic (flow) noise. To accomplish this end we are addressing the coupled fluid/elastic problem to characterize the flow/layer interactions, resultant effects on the turbulent velocity components and effects both at the surface and within the layer. The motivation for the NUSC program is provided by an experiment in 1960 in which significant reductions in the turbulent boundary layer wall pressure spectra were measured on a vehicle coated with U.S. rubber Lamiflo. The Lamiflo coating was basically a version of a dolphin-like surface devised to extend Kramer's well known drag reductions investigations into the flow noise domain. The measured flow noise reductions have yet to be adequately explained or understood. The NUSC program seeks to develop an adequate physical framework within which the effects of compliant layers on flow noise may be understood. GRA

N86-15631# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
A CONSERVATION LAW RELATED TO KELVIN'S CIRCULATION THEOREM Interim Report
B. E. McDonald and J. M. Witting Jan. 1985 13 p
(AD-A157819; NORDA-75) Avail: NTIS HC A02/MF A01 CSCL 20/4

The governing equations for a moving hydrodynamic surface lead to a local conservation law for a surface velocity variable q sub s not in common use. When the surface is closed and applied forces are conservative, the law reduces to Kelvin's circulation theorem. When the flow is irrotational, it reduces to Bernoulli's law. Incorporation of the conservation law into a numerical water wave model case in an Eulerian representation can result in reduction of the prognostic equations from two spatial dimensions to one and in realization of formal accuracy to all order in nonlinearity. In a companion paper, the shallow water diagnostic equation (Poisson's equation) is also reduced to a one-dimensional problem. The prognostic equation derived here thus allows a purely one-dimensional treatment of traditionally two-dimensional shallow water waves. This yields significant resolution and execution speed benefits for the numerical integration of the overall system. Techniques also exist that reduce the deep water diagnostic equation to one dimension. Thus, the new prognostic equation should be useful in modeling two-dimensional deep water waves as a one-dimensional problem. GRA

N86-15632# Naval Underwater Systems Center, New London, Conn.
THE DOWLING WALL PRESSURE-SPECTRUM ANALOGY APPLIED TO AN ISOTROPIC TWO-LAYERED ELASTIC MEDIUM
C. A. Wagner 14 Nov. 1984 38 p
(AD-A158009; NUSC-TR-7235) Avail: NTIS HC A03/MF A01 CSCL 20/4

The Dowling analogy applies Lighthill's equation to predict the surface pressure spectrum on a single elastic layer subjected to turbulent excitation. We have extended the analogy to obtain the low wavenumber surface pressure spectrum for an infinitely long two-layered isotropic elastic media. This low wavenumber model includes the effect of turbulent surface shear stresses on the wall pressure spectrum. The surface pressure spectrum is calculated on the surface of the elastic layer in contact with the turbulent fluid and for the interface between the two different elastic layers. Water is used for the turbulent fluid on one surface of the elastic media. Air at rest is used as the fluid media in contact with the opposite surface. Pressure spectra are given first for the reduced case in which both layers are treated as steel of particular thicknesses at various frequencies. Then, we compare this to the pressure spectrum on the surface of two different viscoelastic layers applied to the steel plates. The results show that the propagation speeds of compressive, shear, and flexural waves in the elastic layers govern the location of singularities in the pressure spectra. It is also shown how damping can affect the strength of the singularities and the level of the local maxima. GRA

N86-15633# Iowa Univ., Iowa City. Inst. of Hydraulic Research.
EFFECTS OF WAVES ON THE BOUNDARY LAYER OF A SURFACE-PIERCING BODY Technical Report, Nov. 1983 - May 1985
F. Stern May 1985 69 p
(Contract N00014-83-K-0136)
(AD-A158053; IIHR-288) Avail: NTIS HC A04/MF A01 CSCL 20/4

The boundary-value problem associated with the boundary-layer development on a surface-piercing body is formulated in a rigorous manner in which proper consideration is given both to the kinematic and dynamic boundary conditions and to the deformation of the potential-flow free surface within the boundary layer. Simplifications that are appropriate for small amplitude waves are then investigated. The flow field in the neighborhood of the body-boundary-layer/free-surface juncture is divided into five regions and order-of-magnitude estimated for each region are provided. Of particular interest is the body free-surface boundary layer in the region very close to the free surface in which the free-surface boundary conditions have a significant influence. In this region, it is shown that, for laminar flow, the parameter Ak/e (where Ak is the wave-steepness parameter and e = delta/L is the nondimensional boundary-layer thickness) is an important parameter for characterizing the flow. Different solution regimes are identified depending on the magnitude of Ak/e. In particular, for Ak/e the magnitude is sufficiently large such that the free-surface boundary conditions have a significant influence. A consistent formulation requires the solution of the partially-parabolic Navier-Stokes equations. For turbulent flow, these conclusions cannot be reached with the same degree of certainty due to the present uncertainties in turbulence modelling, especially when a free surface is present. Numerical results are provided for the idealized geometry of a combination Stokes-wave/flat-plate. GRA

N86-15634# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
TIME-RESOLVED FLOWFIELD MEASUREMENTS IN A TURBINE STAGE M.S. Thesis
J. L. Holt Jun. 1985 166 p
(AD-A158092; AFIT/CI/NR-85-77T) Avail: NTIS HC A08/MF A01 CSCL 20/4

Time-resolved flowfield measurements for a 0.5-meter diameter, high work transonic turbine have been completed in the MIT Turbine Blowdown Facility (TBF). Measurements were taken: to determine the blade-to-blade total temperature profile for comparison with predictions from the Euler turbine equation; to determine the effect of using time-averaged pressures to calculate turbine performance; and to provide a complete set of time-resolved turbine stage data. A preliminary objective (given a 6 kHz blade passing frequency) was to determine the frequency response characteristics of the instrumentation used to make the flowfield measurements. A shock tube was built for this purpose. Measurements were taken with high-frequency response instrumentation including a dual-hot-wire aspirating probe, a four-way angle probe, and two cobra head total pressure probes incorporating silicon diaphragm pressure transducers. The aspirating probe is found to have a natural frequency of 15.5 kHz in the test gas with a damping ratio of 0.36; the angle probe a characteristic frequency of 45 kHz with a settling time of 18 usec. Both results are satisfactory for application in the TBF. The measured total temperature profile shows a peak-to-peak variation of 65 C (20%) and a characteristic frequency twice that of the blade passing frequency. GRA

N86-15635# Technion - Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.
EVOLUTION OF NONLINEAR WAVE GROUPS ON WATER OF SLOWLY-VARYING DEPTH Final Report
M. Stiassnie and R. Iusim Jun. 1985 75 p
(Contract DAJA37-82-C-0300; DA Proj. 1L1-61102-BH-57)
(AD-A158860) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report develops a mathematical formulation which describes the evolution of non-linear wave groups in water of slowly varying depths. It summarizes the derivations of the appropriate equations and their solutions. An approximate analytical solution is provided giving the physical processes involved in the shoaling of wave groups. Also, included are calculations of the induced mean flow accompanying an envelope soliton moving on deep water. GRA

N86-15636# Ballistic Research Labs., Aberdeen Proving Ground, Md.
WAVE MOTION ANALYSIS OF A NONSPINNING LIQUID FILLED CYLINDER Final Report
P. Weinacht and C. J. Nietubicz Jun. 1985 48 p Supersedes IMR-812 dated Apr. 1984
(DA Proj. 1L1-62622-A-554)
(AD-A159324; BRL-MR-3451; IMR-812) Avail: NTIS HC A03/MF A01 CSCL 19/4

The results of a wave motion analysis of a partially liquid-filled, nonspinning cylinder are described. The analysis was undertaken to determine the internal fluid motion of a partially liquid-filled shell when subjected to large impulsive pressures. The high

pressure levels are formed from the rupture of an internal burster tube. The primary concern is the determination of the endwall and sidewall pressure levels after the burster tube rupture. The final objective of this program is to develop a predictive capability which can be used for determining the effects of various liquids, ullages, and burster pressure levels. This report describes an initial analysis of the fluid motion inside a partially liquid-filled, nonspinning cylinder subject to a large impulsive pressure at one end. The analysis presented tracks the pressure wave motion as a function of time and uses conservation of mass and momentum principles to determine the fluid properties in front of and behind the pressure waves. The results show the effect of initial pressure level and ullage on the resulting end wall and side wall pressures as a function of time. The peak end wall pressure is found to vary directly with the initial pressure level. The time duration of the maximum pressure acting on the end wall is a strong function of the ullage and to a lesser degree on the bulk modulus of the liquid. GRA

N86-15637# California Univ., Berkeley. Lawrence Berkeley Lab.
MONITORING OF HOT WATER PLUME MOVEMENTS IN AN AQUIFER WITH BOREHOLD/SURFACE RESISTIVITY MEASUREMENTS
C. F. Tsang and M. J. Wilt May 1985 8 p Presented at ENERSTOCK 1985 International Conference on Energy Storage for Building Heating and Cooling, Toronto, Canada, 22 Sep. 1985
(Contract DE-AC03-76SF-00098)
(DE85-014531; LBL-19644; CONF-850905-4) Avail: NTIS HC A02/MF A01

In this study a simulation of a downhole/surface resistivity experiment to map a hot water plume was performed using a three-dimensional computer code. A fixed amount of hot water was placed in an aquifer between 45 and 70 m below ground surface and resistivity measurements were made at the surface using a current electrode in the hot water body. Results indicate that the anomaly is much greater using the downhole electrode than for surface arrays and that the data may be used to roughly characterize the hot water mass and its boundaries. Several cases involving different plume boundaries were studied and results indicate that the downhole/surface measurements are not very sensitive to differences in the boundary geometry although a rough determination of the boundary position is possible. For the case where the hot water plume is moving relative to the downhole current electrode until it completely leaves the electrode behind, the anomaly size is smaller but the shape allows for good discrimination of the near-side boundary. DOE

N86-15638# Lawrence Livermore National Lab., Calif.
ANALYSIS OF DISLOCATION KINETICS ACROSS SHOCKS
R. B. Stout Jul. 1985 22 p Presented at EXPLOMET '85 Intern. Conf. on Met. Appl. of Shock Wave and High Strain-Rate Phenomena, Portland, Ore., 28 Jul. 1985
(Contract W-7405-eng-48)
(DE85-016444; UCRL-91697; CONF-850770-3) Avail: NTIS HC A02/MF A01

The classical continuum analysis for possible propagating spatial discontinuites of mass density, velocity, stress, and energy across a shock front does not explicity consider the possibility of a discontinuity in the dislocation density function. One reason for not previously considering this possibility is that the dislocation density function does not appear explicity in the mathematical representation for deformation in a continuum approach. For purposes of a more physically realistic model, a discontinuum formulation that does represent interatomic discontinuities and does have an explicit dislocation density dependent deformation and thermodynamics has been developed. Based on this formulation, a discontinuum analysis for a discontinuity in the dislocation density function, as well as the mass density, velocity, stress and energy across a shock is described. In the limit of no dislocation kinetics, the discontinuum shock conditions reduce to the continuum shock conditions. A nonequilibrium thermodynamics is formulated that partitions the work rate at the shock front into different energetic components of internal energy. By applying Onsager's methods, a relationship is derived for the propagation velocity of the shock front in terms of the train discontinuity and dislocation kinetics across the shock front. Because of recent experiments that studied the change in dislocation density resulting from strong shocks, it is believed that these discontinuum shock conditions will be useful to interpret, analyze, and design experiments. DOE

N86-15639# Institut Franco-Allemand de Recherches, St. Louis (France).
PARTICLE SIZING WITH WHISKER COLLECTORS
H. J. Schaefer 7 Nov. 1984 23 p refs Presented at Arnold Engineering Development Center Visit, Arnold Air Force Station, Tenn., 25-28 Sep. 1984
(ISL-CO-230/84) Avail: NTIS HC A02/MF A01

Aerosol sizing for laser anemometry studies in fluid turbulence research, using the whisker sampling method with electron-microscopic evaluation is described. The technique is based on particle deposition on fine-pored fibrous filters, the whisker collectors. By analyzing the particle size distribution on a single collector and its variation across a multistage filter, information on collection efficiency is obtained. Results show that the technique provides meaningful aerosol size distributions of particles > 0.02 microns. This limit is due to the resolving power of the electron microscope employed for the measurements. However, the sizes of all aerosol types considered are clearly > 0.02 microns.
Author (ESA)

N86-15640# Institut Franco-Allemand de Recherches, St. Louis (France).
NEW EXPERIMENTAL TECHNIQUES FOR PROBING GUN BARREL BOUNDARY LAYERS
H. Mach 22 Nov. 1984 12 p refs Presented at 8th International Symposium on Ballistics, Orlando, Florida, 23-25 Oct. 1984
(ISL-CO-234/84) Avail: NTIS HC A02/MF A01

A laser Doppler velocimeter measures velocity histories of the propellant gas flow inside a gun barrel. Two coupled velocimeters measure velocity reductions near the tube wall at distances of 1 mm. A shaped window to measure propellant gas luminances under observation angles of 90 and 27 deg is designed, and used to measure the transmittance of propellant gas residues deposited on its inner surface. To measure surface temperature at the inner side of the window, a sensor based on the temperature dependence of the reflectivity of silver coatings in the UV is designed. Using the optical probes effective absorption thickness of the thermal boundary layer in the 0.5 mm range is detected.
Author (ESA)

N86-15641# Institut Franco-Allemand de Recherches, St. Louis (France).
SPECTROSCOPIC TEMPERATURE MEASUREMENTS IN INTERIOR BALLISTIC ENVIRONMENTS
G. Klingenberg (Ernst-Mach-Inst.) and H. Mach 22 Nov. 1984 14 p refs Presented at 10th International Congress on Instrumentation in Aerospace Simulation Facilities, St. Louis, France, 20-23 Sep. 1983
(ISL-CO-235/84) Avail: NTIS HC A02/MF A01

Spectroscopic temperature measurements during the interior ballistic cycle of a 20 mm test fixture gun and inside the muzzle flash of a 7.62 mm rifle are described. The investigation yields information on temperature distribution in the burning propellant charge of the 20 mm test fixture and on radial temperature profiles in the 7.62 mm muzzle flash region. A technique to obtain temperature during the ignition and combustion within the 20 mm propellant charge is presented. Additional in-bore measurements by quartz windows mounted into bores along the barrel and emission-absorption measurements inside the muzzle flash of the 20 mm test fixture yield a complete temperature profile for the gun system. Spectroscopic infrared measurements inside the muzzle flash of a 7.62 mm rifle complete the investigation.
Author (ESA)

N86-15642# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Forschungsbereich

Stroemungsmechanik.

NUMERICAL STUDY OF THE LAMINAR SHOCK BOUNDARY LAYER INTERACTION Ph.D. Thesis - Karlsruhe Univ., West Germany

Edgar Katzer Feb. 1985 139 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-958)

(DFVLR-FB-85-34; ISSN-0171-1342) Avail: NTIS HC A07/MF A01; DFVLR, Cologne DM 19

The interaction of an oblique shock wave with a laminar boundary layer on an adiabatic flat plate was analyzed numerically with solutions of the two dimensional Navier-Stokes equations using McCormack's explicit finite volume method. The agreement between numerical calculations and experimental results is good. Local and global properties of the interaction region are discussed regarding shock strength, separation bubble length using a similarity law, and separation environment. The asymetrical structure inside the separation bubble produces an asymetrical shape of the wall shear stress distribution. The calculation speed was increased by algorithm vectorization on a CRAY 1S supercomputer. Further investigations for determination of a similarity law in interaction with turbulent boundary layer, of the physical mechanisms of the laminar interaction, and for study of the wall temperature transfer are recommended. Author (ESA)

N86-15643# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Hauptabt. Windkanaele.

RESULTS OF WIND TUNNEL TESTS ON EXTERNAL COMBUSTION

Berthold Schaefer Jan. 1985 55 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-959) Original contains color illustrations

(DFVLR-FB-85-35; ISSN-0171-1342) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 56

Wind tunnel tests on external combustion were carried out to study the flow distribution on a flat plate in a supersonic flow for spoiler optimization and combustion efficiency. The influence of spoiler geometry, mass flow rate and injection angle on flow distribution was studied. The separation area can be enlarged with the spoiler inclination against the flow. Resistance problems and mass flow rate against a split opening are reduced with a hole-line flow nozzle. The area of increased pressure is enlarged by injecting hydrogen in the recirculation area before the spoiler and by igniting the mixture. The cross force after ignition is five times as strong as the spoiler action. Author (ESA)

N86-15644# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Experimentelle Stroemungsmechanik.

INVESTIGATION OF LARGE SCALE STRUCTURES IN A SUBSONIC FREE JET Ph.D. Thesis - Goettingen Univ., West Germany

Hans-Heinrich Claus Jun. 1985 93 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-962)

(DFVLR-FB-85-38; ISSN-0171-1342) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 29.50

Large scale structures in a subsonic free jet were investigated using shadow photographs at Mach numbers from 0.03 to 0.1, with jet acoustic excitation. The shadow photographs show the free jet evolution from the nozzle exhaust to the turbulence entry. The point of instability is characterized by the shear flow thickness corresponding to a critical Reynolds number. The vortex convection velocity in an acoustically excited free jet studied with streak picture illumination depends on the nozzle distance and Strouhal number. The dependence shows good agreement with the course of the phase velocity of density gradient deviations in a natural free jet. The large scale structures in a natural free jet found by average determination of the time rate density gradient deviations does not show any periodic behavior at Mach numbers from 0.3 to 0.6. Investigation of their behavior at Mach numbers visualization using illuminated streak photographs. Author (ESA)

N86-15645# Karlsruhe Univ. (West Germany). Sonderforschungsbereich 210.

[ACTIVITIES AND RESULTS REPORT FOR THE SPECIAL DOMAIN 210] Annual Report, 1983-1984 [ARBEITS- UND ERGEBNISBERICHT DES SONDERFORSCHUNGSBEREICH 210 FUER DIE JAHRE 1983-1984]

R. Friedrich, ed. Mar. 1985 286 p refs In GERMAN

(KU-SFB-210/A/11) Avail: NTIS HC A13/MF A01

Interaction between flows and structures was studied. Numerical simulation of laminar flows about and over obstacles was performed. Wind channel modeling of flow about orographic obstacles and structures, mathematical simulation of the flow system cooling tower-wind field, and instability and motion induced vibrations of up and downstream structures were investigated. The loading of cylindrical structures due to natural wind, and its wind channel modeling, and the resistance behavior and flow about rectangular bodies in turbulent boundary layers were studied. The dynamics of unsteady flow in freely laid pipes was mathematically simulated. Measuring criteria for flocculation reactors and the influence of flow parameters on physiochemical reactions were examined. Flow and sedimentation phenomena in setting tanks were calculated. Miniature laser Doppler systems based on light guides were studied. Author (ESA)

N86-15646# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Neutronenphysik und Reaktortechnik.

TRANSIENT THREE PHASE, THREE COMPONENT FLOW. PART 2: ONE-DIMENSIONAL SLIP MODEL, COMPARISON THEORY-EXPERIMENT

N. I. Kolev Aug. 1985 89 p refs In GERMAN; ENGLISH summary Sponsored by Alexander von Humboldt Foundation

(KfK-3926-Pt-2; ISSN-0303-4003) Avail: NTIS HC A05/MF A01

Prediction and experimentally determined flows were compared using a one dimensional slip model for boiling two-phase flow, pre and postboiling crisis flow and heat transfer, loss-of-flow for nuclear heated rod bundles for typical pressurized water reactors, and critical flow. The results prove the usefulness of the entropy concept in modeling. Author (ESA)

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N86-15647 Department of the Air Force, Washington, D.C.

FERROMAGNETIC RESONANCE PROBE LIFTOFF SUPPRESSION APPARATUS Patent

T. J. Davis and P. L. Tomeraasen, inventors (to Air Force) Issued 9 Jul. 1985 5 p Supersedes AD-D010243

(AD-D011913; US-Patent-4,528,506; US-Patent-Appl-SN-444004; US-Patent-Class-324-225) Avail: US Patent and Trademark Office CSCL 14/2

A liftoff suppression apparatus is described which utilizes a liftoff sensing coil to sense the amount a ferromagnetic resonance probe lifts off the test surface during flaw detection. The liftoff signal is used to modulate the probe's field modulating coil to suppress the liftoff effects. Author (GRA)

N86-15648 Westland Helicopters Ltd., Yeovil (England).

ELASTOHYDRODYNAMIC STUDIES USING THIN FILM TRANSDUCERS Final Report

M. M. A. Safa (Imperial Coll. of Science and Technology, London, England) and P. B. MacPherson Jan. 1984 231 p refs

(Contracts MIN-DEF-A12/1598; MIN-DEF-A91A/971)

(RP-666; BR94608) Avail: NTIS HC A11/MF A01

Thin film microtransducers for application to the study of the

variation of pressure, temperature, and oil film thickness in an elastohydrodynamically lubricated, nominal line contact were developed. Fabrication techniques were improved to enhance the useful life. Techniques to achieve higher resolution by reducing sensor size and improving the signal monitoring circuitry were developed. Material properties in thin film form used in fabricating the sensors were examined. Possible sources of errors in interpreting the results obtained from these devices were studied. Results under various operating conditions were compared with theoretical and experimental results, and reasonably good agreement is found. Author (ESA)

N86-15649 Prins Maurits Lab. TNO, Rijswijk (Netherlands).
THE SURFACE ACOUSTIC WAVE (SAW) CHEMISENSOR. PART 1: A LITERATURE REVIEW [DE SAW-CHEMOSENSOR. 1. EEN LITERATUURSTUDIE]
Z. Klous, A. W. Barendsz, and A. Venema (Technische Hogeschool, Delft, Netherlands) Apr. 1984 60 p refs In DUTCH; ENGLISH summary
(PML-1985-3-Pt-1; TDCK-93000) Copyright. Avail: Issuing Activity

The state of the art of microtransducers for chemical signals is presented. The sensors are grouped according to their operation mode, (semiconductor, optical fiber sensing, and piezoelectric crystal detection). Properties such as response time, sensitivity (detection limit), selectivity, reversibility, and durability are indicated. None of the chemisensors meets all the requirements for measuring equipment. Piezoelectric crystal sensors offer the best perspectives, followed by chemfets and optical waveguide sensors.
Author (ESA)

N86-15650# Rockwell International Corp., Golden, Colo.
PROVING RING CALIBRATIONS USING A DEADWEIGHT PRESSURE SYSTEM
John P. Affatica, Andre L. Grable, and R. L. Thomas (ed.) 25 Feb. 1985 22 p
(Contract DE-AC04-76DP-03533)
(RFP-3677; DOE/TIC-4500-Rev-73) Avail: NTIS HC A02/MF A01

The Rocky Flats Standard Laboratory has devised a method to utilize a deadweight pressure gage to calibrate proving rings to 1,050 pounds of force (lbf). The equipment and the necessary modifications are described, as is the setup and operation. The modifications are additions to the main structure of the pressure gage allowing direct force measurements without damaging or permanently altering the pressure gage. Also included are a brief descrption of the computer program used with the system and an error analysis of the system. This development has increased the Standards Laboratory capabilities; previously, proving rings to be calibrated were sent to the National Bureau of Standards or the Primary Standards Laboratory. Author

N86-15651*# Pratt and Whitney Aircraft, East Hartford, Conn.
DYNAMIC GAS TEMPERATURE MEASUREMENT SYSTEM. VOLUME 2: OPERATION AND PROGRAM MANUAL
Paul T. Purpura [1983] 151 p Sponsored by NASA
(NASA-CR-168267; NAS 1.26:168267) Avail: NTIS HC A08/MF A01 CSCL 14B

The hot section technology (HOST) dynamic gas temperature measurement system computer program acquires data from two type B thermocouples of different diameters. The analysis method determines the in situ value of an aerodynamic parameter T, containing the heat transfer coefficient from the transfer function of the two thermocouples. This aerodynamic parameter is used to compute a fequency response spectrum and compensate the dynamic portion of the signal of the smaller thermocouple. The calculations for the aerodynamic parameter and the data compensation technique are discussed. Compensated data are presented in either the time or frequency domain, time domain data as dynamic temperature vs time, or frequency domain data. E.A.K.

N86-15652# Lawrence Livermore National Lab., Calif.
ULTIMATE LIMITS OF FT-IR
T. Hirschfeld Jul. 1985 9 p Presented at the International Conference on Fourier and Computerized Infrared Spectroscopy, Ottawa, Canada, 24 Jun. 1985
(Contract W-7405-eng-48)
(DE85-016442; UCRL-92414; CONF-8506118-2) Avail: NTIS HC A02/MF A01

Continual improvements in FT-IR have brought us within two orders of magnitude of theoretical limits of the technology, set by the intrinsic noise of the black body spectrum. Further improvements in the technology still require further optimization by step-by-step comparison between actual components performance and their theoretical limit. Among insights from such interferometers, substantial amounts of excess noise in the detectors and nonlinearity in their amplifiers, and an insufficient utilization of the very low aberration levels of interferometers. Beyond this, substantial improvements in spectroscopic sensitivity can be achieved by appropriate choice of the optical interaction. Here the elimination of the 100% line is a particularly desirable goal. The optics of sampling accessories also merit much attention, including throughput matching (and also throughput conservation), optimizing interaction strength, signal strength and detector noise optimization, etc. Finally, data processing can be used to substantially improve the performance capabilities of FT-IR, particularly if we are willing to depart from the conventional data presentations used in IR spectroscopy. DOE

N86-15653# Spectron Development Labs., Inc., Costa Mesa, Calif.
DROPLET SIZING RESEARCH Annual Report, 15 Jan. 1984 - 15 Jan. 1985
C. F. Hess 15 Apr. 1985 63 p
(Contract F49620-83-C-0060)
(AD-A158318; SDL-85-2286-12; AFOSR-85-0562TR) Avail: NTIS HC A04/MF A01 CSCL 14/2

A method to measure the size and velocity of individual particles in a flow is discussed. Results are presented for controlled monodisperse sprays and compared to flash photographs. Typical errors between predicted and measured sizes are less than 5%. Experimental results of the probe volume size are satisfactorily compared to a theoretical algorithm. A very simple optical apparatus is described and used to characterize a spray produced by a simplex nozzle. The size distribution and the Sauter mean diameter of this spray are presented as a function of position and pressure. GRA

N86-15654# Naval Training Equipment Center, Orlando, Fla.
VISUAL DISPLAY PARAMETERS Final Report, Oct. 1982 - Sep. 1984
R. C. Hebb 21 Mar. 1985 63 p
(377-4)
(AD-A158773; NAVTRAEQUIPC-IH-356) Avail: NTIS HC A04/MF A01 CSCL 05/8

The Visual Display Parameters (VDP) project was directed towards the analysis of wide-angle visual displays on dome (or spherical) screens. The objective was to gain the capability to explore the image parameters of distortion, luminance, and resolution of proposed dome displays. A problem with dome displays is in their physical specification and subsequent display performance. Often, the resulting display system does not meet the intended specifications. The main product of the VDP project is a FORTRAN computer program, NVDPMAP, that assists in the analysis of a dome display based on a generalized projection system model. The purpose of the program is to reduce the time spent performing calculations, to automate and improve display analyses, and to provide graphic output concerning a system's performance in an easily digestable form. The parameters of distortion, luminance, and resolution can be examined on perspective and aitoff maps of the display. NVDPMAP can be run via a command sequence menu. Input to NVDPMEAP may be from a formatted input file, or may be entered interactively when running the program. The NVDPMAP program is an aid in designing a dome display and predicting final performance. The basic NVDPMAP program can be modified to change the projector, lens, and screen functions to those of a specific projection system.
GRA

N86-15655# Sandia National Labs., Albuquerque, N. Mex.
DEVELOPMENT OF A PHOTONIC DATA RECORDER
H. P. Davis, G. R. Allen, and J. Chang 1985 6 p Presented at the SPIE International Technical Symposium on Optical and Electro-Optical Engineers, San Diego, California, 18 Aug. 1985
(Contract DE-AC04-76DP-00789)
(DE85-017120; SAND-85-1775C; CONF-850887-21) Avail: NTIS HC A02/MF A01

In conjunction with our implementation of photonic diagnostics on pulsed power accelerators at Sandia, we are developing a photonic data recorder (PDR) which sweeps and records photon analog signals directly rather than coverting photons to electrons and sweeping the electrons, as in a conventional oscilloscope or streak camera. DOE

N86-15656# Midwest Research Inst., Golden, Colo.
INTEGRATING SPHERE SPECTROMETER FOR HIGH-TEMPERATURE MATERIALS CHARACTERIZATION
K. D. Masterson, G. J. Jorgensen, R. W. Burrows, and P. Schissel Aug. 1985 12 p Presented at the SPIE International Technical Symposium on Optical and Electro-Optical Engineers, San Diego, Calif., 18 Aug. 1985
(Contract DE-AC02-83CH-10093)
(DE85-012170; SERI/TP-255-2771; CONF-850887-25) Avail: NTIS HC A02/MF A01

A state-of-the-art, high-temperature integrating sphere spectrometer has been fabricated and characterized. The liquid-cooled sphere is combined with a furnace designed for a maximum specimen temperature of 1200 C. The spectrometer is capable of measuring the spectral, diffuse, and hemispherical reflectance and transmittance over the wavelength range of 0.35 to 2.5 micrometers. Chopped white light from a high pressure xenon arc-lamp is introduced into the sphere, alternately reflected from the sphere wall and reflected from r transmitted through the specimen, spectrally resolved by a monochromator, and focused onto a two-color Si/PbS detector. Data are sampled at wavelengths corresponding to equal energy bands of the terrestrial solar distribution and are graphically displayed. Data acquisition and hardware module commands are computer controlled. The sphere and light collecting optics can be rotated about the horizontal optical axis of the monochromator so that the specimen port is at the top (0 deg), side (90 deg), or bottom (180 deg) of the sphere. This allows optical characterization of a variety of materials relevant to high-temperature solar energy applications to be carried out by rotating the instrument into a desired orientation. For example, in the 9 deg (loop up at the sample) position, reflectance and transmittance of molten salt in a furnace-heated cell can be measured without salt vapor entering the sphere. At 90 deg, a vertical wall of falling sand particles can be characterized. In the 180 deg (look down) position, the optical properties of solids such as ceramics, metal alloys, or powders can be ascertained. DOE

N86-15657# Institut Franco-Allemand de Recherches, St. Louis (France).
USE OF OPTICAL FIBERS IN PULSED HOLOGRAPHY
F. Albe, H. Fagot, and P. Smigielski 16 Oct. 1984 10 p refs Presented at European Conference on Optics, Optical Systems and Applications, Amsterdam, Netherlands, 9-12 Oct. 1984 Submitted for publication
(Contract DRET-83/1160)
(ISL-CO-231/84) Avail: NTIS HC A02/MF A01

Holograms of small objects were recorded through multimode and monomode fibers with ruby and YAG lasers. For a ruby laser giving a pulse of 20 mJ in 20 nsec at 0.6943 microns, set-ups where the object beam passes through a 1 mm-multimode step-index fiber (no fiber for the reference beam) and with the same arrangement for the object beam, the reference passing through a monomode fiber (beam splitter located between the oscillator and the amplifier) were tested. With a YAG laser giving a pulse of 20 mJ in 20 nsec at 0.53 microns, a 1 mm-multimode step-index fiber in the object beam and a 133 microns-multimode step-index fiber in the reference beam, and same arrangement for the object beam and a monomode fiber in the reference beam were tested. In each case single and double-exposure holograms were recorded. Author (ESA)

N86-15425# Hokkaido Univ., Sapporo (Japan).
CRYSTAL ANALYSER MIRROR TYPE DOWN-SCATTERING SPECTROMETER USING SPALLATION NEUTRON SOURCE
K. Inoue, K. Kaji, Y. Kiyanagi, T. Kanaya, H. Iwasa, and K. Nishida *In its* Bulletin of the Faculty of Engineering, Hokkaido Univ., No. 128 Oct. 1985 35 p refs In JAPANESE; ENGLISH summary (For primary document see N86-15420 06-31)
Avail: NTIS HC A06/MF A01

N86-15496# Joint Publications Research Service, Arlington, Va.
APPARATUS FOR EXPERIMENTAL STUDY OF HIGH-RESOLUTION RADIOMETERS AND THEIR CHARACTERISTICS Abstract Only
A. V. Afonin, A. P. Zakharnev, and G. I. Muravyeva *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 24 Transl. into ENGLISH from Optiko-Mekhanicheskaya Promyshlennost (Leningrad, USSR), no. 1, Jan. 1985 p 33-35 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15501# Joint Publications Research Service, Arlington, Va.
SELF-MODULATION INSTABILITY OF GYROTRON EMISSION Abstract Only
G. S. Nusinovich and V. Ye. Zapevalov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 36 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 30, no. 3, Mar. 1985 p 563-570 Original language document was announced in IAA as A85-30487 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15507# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF HOLOGRAM ANALYZER WITH SINGLE-COMPONENT OPTICAL HOLOGRAM MATCHING SYSTEM Abstract Only
L. T. Mustafina, N. P. Kutikova, and N. B. Frantsuzova *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 62 Transl. into ENGLISH from Optiko-Mekhanicheskaya Promyshlennost (Leningrad, USSR), no. 4, Apr. 1985 p 8-10 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15579# Joint Publications Research Service, Arlington, Va.
DIGITAL METHODS OF RECORDING COLOR TELEVISION IMAGES ON FILM TAPE Abstract Only
R. Ya. Krivitskaya and V. M. Semenov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 21-22 Transl. into ENGLISH from Tekhnika Kino i Televideniya (Moscow, USSR), no. 11, Nov. 1984 p 31-35 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15582# Joint Publications Research Service, Arlington, Va.
LUMINESCENCE PHOTOGRAPHY Abstract Only
V. B. Nazarov and M. V. Alfimov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 23-24 Transl. into ENGLISH from Zhurnal Nauchnoy i Prikladnoy Fotografii i Kinematografii (Moscow, USSR), v. 29, no. 4, Jul. - Aug. 1984 p 307-315 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15603# Joint Publications Research Service, Arlington, Va.
RECOMMENDATIONS FOR DEVELOPING SIMULATORS OF SOLAR RADIATION PENETRATING TO THE EARTH'S SURFACE Abstract Only
F. K. Maslovets *In its* USSR Report: Electronics and Electrical

Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 53 Transl. into ENGLISH from Elektrotekhnika (Moscow, USSR), no. 12, Dec. 1984 p 46-48 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15613# Joint Publications Research Service, Arlington, Va.
PHOTOGRAPHIC RECORDING OF TRAJECTORIES OF AEROSOL PARTICLES BY METHOD OF MULTIPLE EXPOSURE Abstract Only
N. S. Mikhovich, B. I. Petrov, and Yu. P. Toporov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 65 Transl. into ENGLISH from Zhurnal Nauchnoy i Prikladnoy Potografii i Kinematografii (Moscow, USSR), v. 29, no. 6, Nov. - Dec. 1984 p 409-413 Original language document was announced in IAA as A85-18300 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15896# Joint Publications Research Service, Arlington, Va.
ADVANCES IN OPTOELECTRONIC, NUCLEAR REACTOR, RADIOBIOLOGICAL RESEARCH: HIGH VOLTAGE OPTO-COUPLER
Jacek Stanislawski and Ewa Serebrankow *In its* East Europe Report: Science and Technology (JPRS-ESA-85-031) 9 Oct. 1985 p 26-36 refs Transl. into ENGLISH from Nukleonika (Warsaw, Poland), v. 27, no. 9-10, 1982 p 419-434 (For primary document see N86-15893 06-31)
Avail: NTIS HC A04/MF A01

N86-15946# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL THEORY OF HOLOGRAPHIC MEMORY Abstract Only
M. V. Karasev and V. P. Maslov *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-009) 19 Nov. 1985 p 13 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), no. 5, 1985 p 1055-1058 (For primary document see N86-15943 06-60)
Avail: NTIS HC A04

36 LASERS AND MASERS

Includes parametric amplifiers.

N86-15658*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SOLAR-PUMPED SOLID STATE Nd LASERS
M. D. Williams and L. Zapata Oct. 1985 24 p refs
(NASA-TM-87615; NAS 1.15:87615) Avail: NTIS HC A02/MF A01 CSCL 20E

Solid state neodymium lasers are considered candidates for space-based polar-pumped laser for continuous power transmission. Laser performance for three different slab laser configurations has been computed to show the excellent power capability of such systems if heat problems can be solved. Ideas involving geometries and materials are offered as potential solutions to the heat problem. Author

N86-15659# Austin Research Associates, Inc., Tex.
THEORETICAL STUDIES OF TWO-DIMENSIONAL EFFECTS IN FREE ELECTRON LASERS Final Technical Report, 1 Feb. - 31 Oct. 1984
M. N. Rosenbluth, H. V. Wong, and B. N. Moore Dec. 1984 148 p
(AF Proj. 2301)
(AD-A158229; I-ARA-84-U-121; ARA-525; AFOSR-85-0493TR) Avail: NTIS HC A07/MF A01 CSCL 20/5

This report describes the development of a two-dimensional numerical simulation free electron laser code which includes pass-to-pass electromagnetic pulse evolution, wave diffraction, transverse betatron motion of the electrons, and frequency discrimination to suppress the growth of unstable sidebands. The code was used to simulate the experiment recently completed at TRW, the experiment being done at LANL, and the proposed MSNW experiment. The TRW simulations are in qualitative agreement with experimental results. The LANL simulations are similar to the one-dimensional simulations (1-D) previously done. The MSNW simulations exhibit general trends which are similar to those of the MSNW 1-D simulations; in both, frequency discrimination improves the trapping efficiency and produces a smooth optical pulse. This report also discusses the feasibility of steady state operation of tapered wigglers in storage rings. Long smooth optical pulses are necessary to reduce energy spreading in the wiggler. Conventional tapered wigglers appear to require lower circulating power levels than phase area displacement wigglers. GRA

N86-15660# Michigan Univ., Ann Arbor.
INVESTIGATIONS OF LASER INITIATED DISCHARGE CHANNELS Annual Summary Report
R. M. Gilgenbach and T. Kammash 19 Aug. 1985 48 p
(Contract N00014-81-K-0700)
(AD-A158872; TR-114) Avail: NTIS HC A03/MF A01 CSCL 20/9

We report progress on the generation of intense, microsecond, electron beams. Diode closure has been studied for electron beam pulselengths up to 4 microseconds. Reduced density channels produced by laser induced gas breakdown and by laser guided discharges are modelled by means of a one dimensional gas hydrodynamics code for times earlier than the onset of convective mixing. Comparison of laser induced gas breakdown experiments with the code indicate that the conversion of laser energy to gas heating is limited to 25 to 30%. Collinear holographic measurements of channel density profiles produced by laser guided discharges are found to be in good agreement with code predictions for times less than 50 s. This agrees with other experiments which have indicated onset times for convective mixing in the range 50 to 70 microsec. after the start of the discharge. A Monte Carlo Fokker Planck code is used to investigate the scattering loss of particles from a relativistic electron beam propagating in a low pressure air channel. GRA

N86-15661# Toronto Univ. (Ontario). Dept. of Chemistry.
LASER PLUS SURFACE-DYNAMICS FACILITY Final Report, 1 Aug. 1984 - 31 Jul. 1985
J. C. Polanyi 31 Jul. 1985 14 p
(Contract N00014-84-G-0184)
(AD-A158922) Avail: NTIS HC A02/MF A01 CSCL 20/5

The objective in this one-year study has been to develop a vacuum ultraviolet (VUV) laser suitable for investigating the simplest of chemical reactions, H + H2 yields H2 + H. This reaction has been fundamental to the development of our understanding of chemical reactions in gases over the past half century, and could come to occupy a similar pivotal role in regard to the elucidation of the molecular dynamics of exchange reactions at surfaces. In order to generate atomic H we have expanded HI from a quartz nozzle (0.1 mm I.D.) into a high vacuum chamber (10 to the -6th power). The density of HI beyond the nozzle could readily be made approx. 0.01 Torr. A Lumonics TE 861-4 excimer laser with unstable resonator operating on KrF at 248 nm (65 mJ/pulse) was used to completely photolyse the HI. When the HI was mixed (ahead of the nozzle) with D2, the reaction H + D2 yields HD + D took place in the jet. A second laser beam was then used (following variable time delay) to probe the reaction product D. GRA

N86-15662# United Technologies Research Center, East Hartford, Conn.
COUPLED HIGH POWER WAVEGUIDE LASER RESEARCH Final Report, 1 Jun. 1984 - 31 May 1985
L. A. Newman, A. J. Cantor, R. A. Hart, J. T. Kennedy, and A. J. DeMaria 30 Jul. 1985 64 p
(Contract F49620-84-C-0062)
(AD-A159079; UTRC/R85-926869; AFOSR-85-0734TR) Avail: NTIS HC A04/MF A01 CSCL 20/5

The United Technologies Research Center (UTRC) conducted a research program to explore a unique ridged waveguide technique

to phase-lock an array of coupled CO2 waveguide lasers. The motivation for this investigation was scale the output power capability of CO2 waveguide lasers by one to two orders of magnitude greater than the present state-of-the-art (i.e., scale to power levels of 100 W to 1 kW) while maintaining single frequency operation. A 1 year program was conducted to test the feasibility of the ridged waveguide coupling technique. The feasibility study clearly produced positive results. In particular, stable phase-locked operation of two and three-channel arrays was demonstrated at the 50 W level. Phase-locking was maintained in a laboratory environment for many hours without adjustments other than length tuning of the laser. In addition, a first-order theory was developed to strengthen the understanding of the coupled waveguide laser array. Author (GRA)

N86-15663# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MODAL ANALYSIS OF UNSTABLE RESONATORS Ph.D. Thesis
M. E. Rogers 3 Apr. 1985 249 p
(AD-A159225; AFIT/DS/PH-85-2) Avail: NTIS HC A11/MF A01 CSCL 20/5

The analysis of the modes of optical resonators is crucial to understanding how actual laser devices operate. A consistent formulation that treats both the empty and loaded resonator modes is presented in this report. The study centers on unstable resonators and, in particular, strip resonators. The analysis of the bare cavity modes uses a matrix expansion technique with the linear prolate functions as a basis set. These functions form an optimal basis set in that they are related to the Schmidt expansion functions for the integral equation that describes the modes of the bare cavity. As a consequence, the matrix eigenvalue problem is solved using the minimum number of basis functions. The analysis is implemented in a numerical model that generates the linear prolate functions using a finite difference algorithm. The model was used to study the validity of the asymptotic approach at low Fresnel numbers. The results show that the first few lower loss modes predicted by the asymptotic approach are accurate but that the higher loss modes are inaccurately represented by that approach. The linear prolate function expansion is also used to numerically demonstrate the orthogonality of the resonator modes. GRA

N86-15664# California Univ., Los Angeles. Dept. of Materials Science and Engineering.
BETA ALUMINA: A SOLID-ELECTROLYTE AS A SOLID-STATE LASER HOST
B. Dunn, J. O. Thomas, and G. C. Farrington Sep. 1985 14 p
(Contract N00014-83-K-0498)
(AD-A159409; TR-7) Avail: NTIS HC A02/MF A01 CSCL 20/5

Sodium beta alumina is a non-stoichiometric sodium aluminate known for its rapid transport of Na(+) ions. The unique ability of Beta alumina to exhibit divalent and trivalent cation motion permits optically active ions to be introduced in the structure by low temperature ion exchange techniques. The synthesis, structure and optical properties of Nd(3+) exchanged Beta alumina are reviewed in this paper. The material exhibits interesting optical properties, including laser action in small platelet crystals. The structure of the conduction plane, the presence of Na(+) and its motion all appear to have a significant influence on optical properties. Sodium Beta alumina is a non-stoichiometric solid electrolyte known for its high conductivity of Na(+) ions. The structure consists of spinal blocks of closely packed Al(3+) and O(2-) separated by loosely packed slabs containing Na(+) and O(2-) ions. The open space within these slabs permits rapid Na(+) migration in two dimensions. GRA

N86-15665# California Univ., Santa Barbara. Quantum Inst.
ANGULAR-GAIN SPECTRUM OF FREE ELECTRON LASERS Final Report, 1 Jul. 1984 - 28 Feb. 1985
W. B. Colson, G. Dattoli, and F. Ciocci Feb. 1985 16 p
(Contract N00014-81-K-0809)
(AD-A159412; FR-3) Avail: NTIS HC A02/MF A01 CSCL 20/5

The theory of free-electron lasers is extended to include the new coupling between an electron beam and optical wave propagating at an angle theta in an arbitrary harmonic. The coupling allows the laser to be tuned to a wider range of wavelengths and to include the effects of emittance in the electron beam. The formulation of the results in terms of coupling constants means that the existing knowledge of high gain, low gain, weak optical fields, strong optical fields, and short pulses in free electron lasers can be immediately generalized to off-axis propagation in an arbitrary harmonic. Author (GRA)

N86-15666# Alabama Univ., Huntsville.
PLASMAS AS LIGHT SOURCES FOR LASERS Final Technical Report
T. A. Barr, Jr. and W. B. McKnight Sep. 1984 47 p
(Contract DAAH01-82-D-A016)
(AD-A159460; AD-E950752; AMSMI/RH-CR-85-14) Avail: NTIS HC A03/MF A01 CSCL 20/5

This report describes an experimental and analytical investigation of the properties of high intensity, visible wavelength, light sources for optical pumping of pulsed lasers. Background information on rsearch that may be applicable to this problem is presented, the experiment design is outlined and the results of system modelling are detailed. The experimental apparatus, consisting of a Blumlein pulse-forming network and a cylindrical plasma cell load, is described. The instrumentation used for the experiment is discussed, and experimental results are presented, together with a possible explanation of the optical radiation-time history of the plasma. Potential applications are evaluated and future development recommended. Author (GRA)

N86-15667# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Electronique et Physique.
EFFECT OF OPTICAL INJECTION ON THE OPTICAL PROPERTIES OF A (GaAl)As SEMICONDUCTOR LASER: OPTICAL BISTABILITY AND FOUR WAVE MIXING Ph.D. Thesis [EFFETS DE L'INJECTION OPTIQUE SUR LES PROPRIETES OPTIQUES D'UN LASER A SEMICONDUCTEUR (GaAl)As: BISTABILITE OPTIQUE ET MELANGE A QUATRE ONDES]
Hisao Nakajima 24 Apr. 1985 165 p refs In FRENCH
(ENST-85E005; ISSN-0751-1353) Avail: NTIS HC A08/MF A01

The optical bistability is observed and the magnitude of the nonlinear susceptibility of (GaAl)As semiconductor is estimated. The two laser experimental assembly is described. The spectral width of a semiconductor laser with optical injection is discussed. The observations of optical bistability and optical memorization are described. The linear mixing of four waves in a laser cavity is analyzed. The possibility of studying the processes in a nonlinear Fabry-Perot interferometer is demonstrated. Author (ESA)

N86-15668*# Institut Franco-Allemand de Recherches, St. Louis (France).
STUDY OF HIGH SPEED COMBUSTION FLOWS BY LASER VELOCIMETRY
H. J. Schaefer 26 Oct. 1984 29 p Presented at NASA Langley Research Center Visit, Hampton, VA., 5 Oct. 1984 Sponsored in part by NASA
(NASA-CR-176439; NAS 1.26:176439; ISL-CO-232/84) Avail: NTIS HC A03/MF A01

The feasibility of laser velocimetry in a high temperature jet was assessed in a model of an aircraft engine combustor. Experiments show that the problems encountered in measuring combustion flow can flow can be overcome by a carefully designed optical set-up and an appropriate signal processing and data acquisition system. Laser Doppler velocimetry provides useful information about coherent structures in hot free jets. The measurements agree with measurements in an isothermal jet. Author (ESA)

N86-15436# Joint Publications Research Service, Arlington, Va.
FRG TURNS EFFORTS TO LASER DEVELOPMENT
Klaus Gertoberens *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-028) 19 Sep. 1985 p 27-28 Transl. into ENGLISH

from Sueddeutsche Zeitung (Munich), 17 Jul. 1985 p 25 (For primary document see N86-15435 06-31)
Avail: NTIS HC A04/MF A01

N86-15440# Joint Publications Research Service, Arlington, Va.
CHINA REACHES NEW LEVEL IN MINICOMPUTER DEVELOPMENT
In its China Report: Science and Technology (JPRS-CST-85-038) 5 Nov. 1985 p 39-46 refs Transl. into ENGLISH from Jisuanji Shijie (Beijing), no. 15, 8 Aug. 1985 p 1 (For primary document see N86-15438 06-31)
Avail: NTIS HC A06/MF A01

N86-15469# Joint Publications Research Service, Arlington, Va.
LASER TECHNOLOGY IN MANUFACTURE OF PRINTED-CIRCUIT BOARDS Abstract Only
G. A. Machulka, M. F. Stelmakh, and A. B. Uladinov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 84 Transl. into ENGLISH from Radiotekhnika (Moscow, USSR), no. 2, Feb. 1985 p 3-11 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

N86-15482# Joint Publications Research Service, Arlington, Va.
DELAY EFFECT IN PULSED AVALANCHE DISCHARGE OF AN XeCl LASER AT HIGH GAS PRESSURE
Lou Qihong *In its* China Report: Science and Technology (JPRS-CST-85-040) 20 Nov. 1985 p 45-49 refs Transl. into ENGLISH from Wuli Xuebao (Beijing, China), v. 34, no. 7, Jul. 1985 p 960-963 (For primary document see N86-15478 06-31)
Avail: NTIS HC A06/MF A01

N86-15498# Joint Publications Research Service, Arlington, Va.
HIGH-POWER SOURCES WITH SMOOTHLY ADJUSTABLE PULSE DURATION FOR POWERING GAS-DISCHARGE TUBES OF LASER PUMPING SYSTEMS Abstract Only
V. M. Vakulenko, L. P. Ivanov, Yu. A. Ganshin, I. L. Karpyshev, and V. A. Korneyev *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 29-30 Transl. into ENGLISH from Elektrotekhnika (Moscow, USSR), no. 3, Mar. 1985 p 19-20 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15499# Joint Publications Research Service, Arlington, Va.
HIGH-POWER PULSE GENERATOR WITH PULSEFORM CONTROL FOR POWERING GAS-DISCHARGE TUBES OF LASER PUMPING SYSTEMS Abstract Only
L. P. Ivanov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 30-31 Transl. into ENGLISH from Elektrotekhnika (Moscow, USSR), no. 3, Mar. 1985 p 21-22 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N86-15669 Department of the Air Force, Washington, D.C.
MACHINE WITH AN INTERMITTENTLY ROTATING TABLE FOR THE PERFORMANCE OF WORK OPERATIONS Patent
M. Gippa, inventor (to Air Force) Issued 18 Jun. 1985 8 p
(AD-D011911; US-Patent-4,523,359; US-Patent-Appl-SN-454081; US-Patent-Class-29-38) Avail: US Patent and Trademark Office CSCL 13/9

A machine is described which has an intermittently rotating table for holding parts to be worked on or assembled. Operating units are actuable either simultaneously for all units or groups of units, or independently of one another. The operating units can be mounted vertically over or under the table and also laterally and can receive the rotary movement of a central wheel or independent motors. According to a perfect embodiment, the control of the feed is effected by the central shaft. During a work cycle, this shaft makes a vertical movement and transmits that movement to the operating units by radial linear cams i.e., feed and return occur during a single movement of the shaft, for example, downward. During idle time, i.e., the time used to move and index the table but not to perform the work, the central shaft is also turned through a certain angle so that the linear cams are no longer in contact with the operating units and in this position the central shaft is returned without influencing the operating units. Thus it is possible to give the operating units any feed and return characteristic of machines with rotary cams, while having very much simplified kinematics. GRA

N86-15670# Ballistic Research Labs., Aberdeen Proving Ground, Md.
STEADY STATE PENETRATION OF RIGID PERFECTLY PLASTIC TARGETS
R. C. Batra and T. W. Wright May 1985 38 p
(AD-A158081; AD-F630692; BRL-TR-2656) Avail: NTIS HC A03/MF A01 CSCL 19/4

In this paper a detailed numerical solution to an idealized penetration problem is presented in an attempt to shed some light on these matters. The problem of steady penetration by a semi-infinite, rigid penetrator into an infinite, rigid/perfectly plastic target has been studied. The rod is assumed to be cylindrical, with a hemispherical nose, and the target is assumed to obey the Von Mises yield criterion with the associated flow rule. Contact between target and penetrator has been assumed to be smooth and frictionless. Results computed and presented graphically include the velocity field in the target, the tangential velocity of target particles on the penetrator nose, normal pressure over the penetrator nose, and the dependence of the axial resisting force on penetrator speed and target strength. The kinematics and stress fields found in this paper should prove useful in devising or checking the results from simpler engineering theories of penetration. GRA

N86-15671# Department of the Air Force, Washington, D.C.
ADAPTER PALLET SYSTEM Patent Application
F. R. Harris, inventor (to Air Force) Filed 11 Dec. 1984 17 p
(AD-D011858; US-Patent-Appl-SN-680611) Avail: NTIS HC A02/MF A01 CSCL 15/5

A bifurcated adapter pallet system for providing an interface between the 463L and ISO systems is presented. Each adapter has mounting faces to attach to an ISO container at the container corner fittings and 463L tongues for restraint by 463L equipment. The ISO/463L adapter pallet facilitates efficient and appropriate tiedown and transportation of ISO cargo by means of vehicles equipped with the 463L handling system. GRA

N86-15672# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ELASTIC BEARING
16 Aug. 1985 7 p Transl. into ENGLISH from Hangkong Zhishi (China), no. 12, Dec. 1982 p 19
(AD-A159140; FTD-ID(RS)T-0562-85) Avail: NTIS HC A02/MF A01 CSCL 13/9

The common ball bearings and sliding bearings are well known to people since they are widely employed in modern industries such as trains, automobiles, ships, aircraft, machine tools, instruments, etc. They have also been used in many household appliances or equipment such as fan, sewing machine, bicycle, clock, etc. The elastic bearings are rather unfamiliar to people. This report describes the features of elastic bearings and compares them to sliding and ball bearings. An elastic bearing has a thick inner sleeve and an outer sleeve similar to most common bearings. However, it contains no steel balls or cylindrical rods of the ball bearings. It has, instead, a laminated structure with alternative layers of metal and rubber. It usually contains 30 to 40 layers or more. GRA

N86-15673# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Automatic Control.
PRELIMINARY STUDY ON THE CONTROL OF A DIRECT

INJECTION DIESEL ENGINE FOR BETTER FUEL FLEXIBILITY AND EMISSIONS CONTROL, PARTS 1 AND 2
Rolf Egnell (Aspen Utvecklings AB, Lerum), Nabil Kassem, and Torsten Bohlin 1985 71 p refs Partly in ENGLISH and SWEDISH Prepared for Swedish Motor Fuel Technology Co., Stockholm
(Grant STU-83-4018)
(TRITA-REG-8501) Avail: NTIS HC A04/MF A01

Qualitative dynamic aspects, factors that affect the transient behavior of the diesel engine and methods to improve the transient response, thus reducing fuel consumption and smoke emissions, are reviewed. Literature on sensors, actuators, and injection systems was surveyed to decide if these components satisfy the requirements of electronic control systems. Dynamic aspects and thermal loading; time delay of fuel injection; control system design; adaptive and transient compensation control of air/fuel ratio; control of boost pressure; retardation of injection timing; and combined electronic control of fuel injection and air supercharging are considered. Author (ESA)

N86-15674# Sheffield Univ. (England). Dept. of Control Engineering.
PROGRESS ON COMBINED LOAD- AND PROFILE-CONTROL FOR HORIZONTAL-TURRET, SINGLE- AND DOUBLE-ARM TUNNELLING MACHINES Progress Report
J. B. Edwards and S. M. Sadreddini Apr. 1985 25 p refs
(Contract NCB-PSD-19(84))
(RR-276) Avail: NTIS HC A02/MF A01

A combined load-profile control system for horizontal-turret machines that can be readily adapted for other mechanisms is designed. Simulation results for the system algorithm coupled to a much simplified model of the machine's cutting dynamics are given. The double-arm mechanism is analyzed and simulations showing the movement of the two arms and the torques developed at the pivots are presented. Author (ESA)

N86-15675# Technische Hogeschool, Twente (Netherlands). Afdeling der Werktuigbouwkunde.
INVESTIGATION OF THE FRICTION OF BECORIT 820 VERSUS CAST IRON [ONDERZOEK NAAR DE WRIJVING VAN BECORIT 820 VERSUS GIETIJZER]
P. H. Vroegop Sep. 1983 15 p In DUTCH
(WB-83/Tri-10053) Avail: NTIS HC A02/MF A01

The tribotechnical behavior of Becorit 820 on C 45 steel and CG 25 iron was investigated, using a tribometer. Becorit 820, an asbestos-metal particles resin matrix composite, is used with cast iron for disk brakes in subway cars. Causes of a large (temporal) decrease of friction were examined. Friction as function of temperature was investigated. Investigating the wear, the resin shows a water absorbtion possibility of 1%. Cooling the disk to below dew point, friction measurements show a temporal friction coefficient reduction of < 1/3 of higher temperature values.
Author (ESA)

N86-15676# Instituut TNO voor Werktuigkundige Constructies, Delft (Netherlands).
STATIC AND DYNAMIC MATERIAL MODEL FOR ELASTOHYDRODYNAMIC BEARING CALCULATIONS [STATISCH EN DYNAMISCH MATERIAAL-MODEL T.B.V. ELASTOHYDRODYNAMISCHE LAGER BEREKENINGEN]
S. Seinstra Dec. 1984 61 p refs In DUTCH
(Contract A76/KM/134)
(IWECO-5076503; TDCK-79878) Avail: NTIS HC A04/MF A01

Possibilities and conditions to model the dynamic behavior of rubber and synthetic bearing race materials were investigated. Stiffness and damping coefficients of water lubricated propeller shaft bearings with elastic race are insufficiently known. Based on a literature review, nonlinear elasticity, high damping, and incompressible behavior is assessed. Clear differences between static and dynamic properties are noted. A dynamic model using a complex dynamic modulus of elasticity is described. Author (ESA)

N86-15677# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abt. Regelung.
BALANCING OF A ROD USING A DIGITALLY CONTROLLED ROBOT
Klaus-Peter Sondergeld Jul. 1985 70 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-966) Sponsored by Stiftung Volkswagenwerk
(DFVLR-FB-85-41; ISSN-0171-1342) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 25

A digital linear controller based on the ASEA IRB 60 robot was designed for balancing a rod suspended at a cardan. The rod deflection angles were measured with potentiometers on the robot arm. The transmission behavior of the robot was modeled with a linear system of second order with dead times. The controller parameters were determined by sequential linear least squares programming. The theoretical results are confirmed by an experiment which shows the possible balancing of a rod with the robot with respect to the boundary conditions (deflection angle and rod position, oversimplification of the mathematical robot model, robot arm velocity up to 0.3 m/sec and deflection up to 0.5 m) and with application of a joystick potentiometer. A more accurate identification of the robot model parameters with a suspended pendulum is recommended. Author (ESA)

N86-15678# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
5 Sep. 1985 76 p Transl. into ENGLISH from various West European articles
(JPRS-WST-85-027) Avail: NTIS HC A05/MF A01

Progress in West European science and technology is reported. Topics include: aerospace, automobile industry, biotechnology, computers, microelectronics, scientific and industrial policy, and technology transfer. For individual titles, see N86-15679 through N86-15679.

N86-15679# Joint Publications Research Service, Arlington, Va.
FIAT TO ASSEMBLE EFFICIENT ENGINE IN AUTOMATED PLANT
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-027) 5 Sep. 1985 p 21-30 Transl. into ENGLISH from ATA Ing. Automotoristica (Turin), May 1985 p 354-370 (For primary document see N86-15678 06-37)
Avail: NTIS HC A05/MF A01

The development of Fiat's Fire 1000 engine is described. A new plant was built since it was impossible to produce a radically new engine in any existing conventional production facility. It was decided to go back to square one, in designing the engine and in deivising and building the equipment, and to do both jobs at the same time. The interchange between the engine's designers and those working on the plant led to simpler and more elegant solutions and to construction of a plant endowed with an exceptional productivity potential. Both the engine and the plant are the offspring of an innovative design and planning philosophy. The plant was build after the production lines were designed which made it possible to set up the lines in the most efficient way and to achieve an optimum flow of materials to and through the plant.
E.A.K.

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N86-15680*# Houston Univ., Tex. Dept. of Mechnaical Engineering.
NONDESTRUCTIVE ULTRASONIC CHARACTERIZATION OF ENGINEERING MATERIALS Final Report
Kamel Salama Nov. 1985 23 p refs
(Contract NCC1-88)
(NASA-CR-176349; NAS 1.26:176349) Avail: NTIS HC A02/MF A01 CSCL 14D

The development of an ultrasonic method for the nondestructive characterization of mechanical properties of engineering material is described. The method utilizes the nonlinearity parameter measurement which describes the anharmonic behavior of the solid through measurements of amplitudes of the fundamental and of the generated second harmonic ultrasonic waves. The nonlinearity parameter is also directly related to the acoustoelastic constant of the solid which can be determined by measuring the linear dependence of ultrasonic velocity on stress. A major advantage of measurements of the nonlinearity parameter over that of the acoustoelastic constant is that it may be determined without the application of stress on the material, which makes it more applicable for in-service nondestructive characterization. The relationships between the nonlinearity parameter of second-harmonic generation and the percentage of solid solution phase in engineering materials such as heat treatable aluminum alloys was established. The acoustoelastic constants are measured on these alloys for comparison and confirmation. A linear relationship between the nonlinearity parameter and the volume fraction of second phase precipitates in the alloys is indicated. E.A.K.

N86-15681# University of Southern California, Los Angeles. Dept. of Electrical Engineering.
BASIC RESEARCH IN RELIABILITY FOR REAL SYSTEMS Annual Technical Report, 15 Jul. 1984 - 14 Jul. 1985
V. O. K. Li 14 Jul. 1985 6 p
(Grant AF-AFOSR-0269-84)
(AD-A159100; AFOSR-85-0711TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The Event-Based Reliability Model (EBRM) was developed to model and analyze the reliability of a network in which component failures are statistically dependent. In EBRM, the events that could cause component failures were modeled explicitly. This approach had the great advantage that it required much less parameters than the traditional model employing conditional probabilities. The EBRM was also proved to be a completely general model which could be applied to any kind of failure dependencies. For reliability evaluations, many existing algorithms for computing network reliability could be used with minor modifications and no significant increase in computational complexity. An improved algorithm for the appropriate evaluation of network performance was also developed. For multistate systems, ordered enumeration was used to approximate and bound system reliabilities and other performance measures, and an efficient algorithm was developed for this purpose. Author (GRA)

N86-15682# La Jolla Inst., Calif. Center for the Study of Nonlinear Dynamics.
THEORETICAL STUDIES IN NONDESTRUCTIVE EVALUATION (NDE) Final Report, 1 Jul. 1980 - 14 Feb. 1984
B. J. West Apr. 1985 87 p
(Contract F49620-81-K-0017)
(AD-A159155; LJI-R-85-318; AFOSR-85-0730TR) Avail: NTIS HC A05/MF A01 CSCL 20/1

A previously developed technique has been use to describe the discrete scattering of scalar waves from defects on a regular simple cubic lattice. THe method makes no assumption about the symmetry of the scatterers and therefore can be applied to inhomogeneities of arbitrary shape. The only limitation of the technique is the maximum number of defects one can use to specify the scatter, which in turn is determined by limitations in computation time. The multiple scattering model proposed by Foldy and later extended by Lax was implemented by West and Shlesinger as a means of evaluating the distribution of grains in polycrystalline materials. If the material consists of grains such that the wavelength is much larger than the grain size then the density of scatterers probed by the acoustic wave is unchanged as the frequency is increased, provided that one remains in the Rayleigh scattering domain. If one is in the scattering domain where the wavelength is less than or equal to the grain size, then the density of scatterers increases no more rapidly than the square of the linear scale (a-squared) rather than as its cube as it would in the usual situation. This implies that the density of scatterers is a fractal in the stochastic scattering domain. Note also that the surface of a grain can have many scales and may in part be responsible for the fractal behavior observed in the phenomenological expression. GRA

N86-15683# Materials Research Labs., Ascot Vale (Australia).
USE OF ULTRASONICS TO DETERMINE THE CRACK SIZE IN HIGH STRENGTH STEEL GUN BARRELS
G. Wulf Jan. 1985 28 p
(AD-A159405; MRL-R-953) Avail: NTIS HC A03/MF A01 CSCL 19/6

The use of high strength steel for large caliber gun barrels has increased the possibility that fatigue crack growth, as opposed to wear and erosion, will determine the safe life of a barrel. This is the case for the 5-in/54 Naval Gun. Because fatigue cracking may lead to catastrophic failure, it is necessary to provide some form of life prediction that will ensure that fatigue cracks or other damage will not grow to a critical size. Fortunately such a provision can be confidently based on fracture mechanics. The role of nondestructive testing is to check the crack length predictions and to ensure that cracks corresponding to the critical crack size for rapid fracture at the design load are not attained while the barrel remains in service. The ultrasonic end-on probe technique described provides a simple method of rapidly detecting, locating and sizing cracks without shadowing, and without the need for calculations required by other techniques. Author (GRA)

N86-15684# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
ACOUSTICAL IMAGING SYSTEM EVALUATION Final Report, 1 May 1984 - 31 May 1985
M. Foley Sep. 1985 20 p
(AF Proj. 5730)
(AD-A159425; AFRPL-TR-85-057) Avail: NTIS HC A02/MF A01 CSCL 14/2

A nondestructive evaluation device was delivered to the AFRPL by Battelle Laboratories. The sensitivity and other operational limitations of the device were not known, and a project was initiated at the AFRPL to determine those parameters. Sensitivities for both the through transmission subsystem and the pulse echo subsystem were determined. Both techniques use ultrasound to detect inner bore cracks in the propellant grains, and case/liner debonds (respectively) in tactical missile motors. In addition, the limitation of the mechanical subsystem and the transducer head geometry were investigated. Several inert analog motor sections, with both metal and phenolic cases, were used in the investigation, including a full size inert Sidewinder motor. The goal for the technology is to produce a field-usable motor health monitor for the DOD. GRA

N86-15451# Joint Publications Research Service, Arlington, Va.
FRG USES LASER FOR NON-DESTRUCTIVE TESTING IN WIND CANAL
In its West Europe Report: Science and Technology (JPRS-WST-85-024) 13 Aug. 1985 p 25-26 Transl. into ENGLISH from VDI Nachrichten (Dusseldorf), 5 Apr. 1985 p 16 (For primary document see N86-15447 06-31)
Avail: NTIS HC A04/MF A01

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N86-15685 Welding Inst., Cambridge (England).
FRACTURE TOUGHNESS TESTING OF LASER WELDS IN 2 mm THICK TITANIUM ALLOY IMI 550 Final Report
M. H. Scott, J. R. Gordon, and M. F. Gittos Mar. 1985 27 p refs

(Contract MIN-DEF-A91A/1149)
(Rept-3784/1/85; BR95196) Avail: NTIS HC A03/MF A01

Compact specimens are used to assess the toughness of laser welds in 2 mm thick IMI 550 Ti alloy sheet in the as-welded state and after a stress-relieving heat treatment. Tensile and hardness tests are also made on the welds. All testing is carried out at room temperature. Problems are experienced in making acceptable welds reproducibly and also in carrying out the toughness tests. The latter is because of crack deviation during fatigue precracking and the toughness tests themselves. In the as-welded state the weld metal has similar or greater toughness than the parent metal but heat treatment causes a reduction below that of the as-received parent metal. In all cases, fracture takes place in a brittle manner. The welds are harder than the parent metal with lower proof stresses but higher tensile strengths. Heat treatment raises proof stresses without markedly affecting tensile strength. Author (ESA)

N86-15686# Sydney Univ. (Australia). School of Civil and Mining Engineering.
THE DYNAMIC RESPONSE OF DISCRETELY DAMPED STRUCTURES UNDER HARMONIC AND RANDOM EXCITATION
W. K. Wheeler and G. J. Hancock Jul. 1984 33 p refs
(R-475) Avail: NTIS HC A03/MF A01

One of the ways to minimize the excitation of structure under dynamic load is to include viscous dampers both within the structure and connected to points of support outside the structure. However, the magnitude of the damping required and the position of the dampers is not always easily determined. For multi-degree of freedom structures, some modes may not be damped while others may be excessively damped. Excessive damping of one mode may also precipitate other modes of vibration. An analysis based on the frequency response method for studying the dynamic response of framed structures under both harmonic and random excitation is described. Studies of a multi-storey frame structure and a cable stayed pedestrian footbridge are described. These studies include investigations of the location and magnitude of the dampers. Author

N86-15687*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
EFFECTS OF LOAD PROPORTIONING ON THE CAPACITY OF MULTIPLE-HOLE COMPOSITE JOINTS Final Report, Mar. 1984 - Mar. 1985
M. W. Hyer (Maryland Univ., College Park) and P. A. Chastain (Aerojet Strategic Propulsion Co., Sacramento, Calif.) Nov. 1985 176 p Sponsored in part by Army Aviation Systems Command
(Grant NAG1-343)
(NASA-CR-178019; NAS 1.26:178019) Avail: NTIS HC A09/MF A01 CSCL 20K

This study addresses the issue of adjusting the proportion of load transmitted by each hole in a multiple-hole joint so that the joint capacity is a maximum. Specifically two-hole-in-series joints are examined. The results indicate that when each hole reacts 50% of the total load, the joint capacity is not a maximum. One hole generally is understressed at joint failure. The algorithm developed to determine the load proportion at each hole which results in maximum capacity is discussed. The algorithm includes two-dimensional finite-element stress analysis and failure criteria. The algorithm is used to study the effects of joint width, hole spacing, and hole to joint-end distance on load proportioning and capacity. To study hole size effects, two hole diameters are considered. Three laminates are considered: a quasi-isotropic laminate; a cross-ply laminate; and a 45 degree angle-ply laminate. By proportioning the load, capacity can be increased generally from 5 to 10%. In some cases a greater increase is possible. Author

N86-15688*# Failure Analysis Associates, Palo Alto, Calif. Engineering and Metallurgical Consultants.
TECHNIQUES FOR FATIGUE LIFE PREDICTIONS FROM MEASURED STRAINS
Robert Sire, Philip Besuner, Craig Schoof, and Jerrell Thomas Aug. 1985 174 p refs
(Contract NAS8-34971)
(NASA-CR-178574; NAS 1.26:178574; FaAA-PA-R-85-06-13; RAS:FR-9746) Avail: NTIS HC A08/MF A01 CSCL 20K

Orginal fatigue life prediction methods for certain components of the Space Shuttle Main Engines (SSME) have proved inaccurate in light of failure experience. An effort is made to improve fatigue life prediction methods. Research is focused on 1) the characterization of fatigue environments as a function of engine operating parameters and 2) the improvement of fatigue life estimates based on strain information from engine tests. In Phase 1 of the project, completed in July 1984, main injector LOX-post strain data is used to illustrate a cycle-by-cycle fatigue damage calculation method and software. In Phase 2, the software is used to statistically characterize the loading environments of two additional components: the high pressure oxidizer turbopump (HPOTP) bearing cartridge and the main combustion chamber (MCC) coolant inlet duct. Data tapes are supplied for a third additional component, the HPOTP discharge duct. A cycle-by-cycle (CBC) fatigue damage model which uses experimental strain histories to predict the relative impact that variations in engine operating parameters have on fatigue life has been developed. Author

N86-15689*# Failure Analysis Associates, Palo Alto, Calif. Engineering and Metallurgical Consultants.
TECHNIQUES FOR FATIGUE LIFE PREDICTIONS FROM MEASURED STRAINS. APPENDIX E: HPOTP BEARING CARTRIDGE AND MCC COOLANT INLET DUCT POWER SPECTRAL DENSITIES Final Report
Robert Sire, Philip Besuner, Craig Schoof, and Jerrell Thomas Aug. 1985 266 p
(Contract NAS8-34971)
(NASA-CR-178515; NAS 1.26:178515; FaAA-PA-R-85-06-13-App-E; RAS:FR-9746-App-E) Avail: NTIS HC A12/MF A01 CSCL 20K

In this appendix to the main report, power spectral densities are given for high pressure oxidizer turbopump (HPOTP) bearing cartridges and main combustion chambers (MCC) coolant inlet ducts. The power spectra are measured for HPOTP bearing cartridges at 30, 180, and 300 deg gages. The power spectra for MCC coolant inlet duct is measured at gage 5 and gage 7. There is no text. E.R.

N86-15690# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Automation Technology Center.
SPRING STIFFNESSES FOR BEAM-COLUMN ANALYSIS OF SOIL-STRUCTURE INTERACTION PROBLEMS Final Report
R. L. Hall Jul. 1985 128 p
(AD-A158072; AD-F630692; WES/TR/K-85-2) Avail: NTIS HC A07/MF A01 CSCL 13/13

The study documented in this report provides a simple means of combining a two-dimensional foundation with a beam-column structure for use in preliminary design and analysis. The report demonstrates that a foundation can be investigated and formed independently of the structural beam-column matrix. Two procedures for developing and interface matrix, which represents a linear elastic semi-infinite half plane, are presented. The terms needed to construct the interface matrix are dependent on values of Poisson's ratio and the modulus of elasticity of the foundation. Details on the two procedures, necessary terms to generate interface matrices, and example problems are provided. GRA

N86-15691# Northwestern Univ., Evanston, Ill. Dept. of Materials Science.
PROFILE FITTING IN RESIDUAL STRESS DETERMINATION
T. J. Devine and J. B. Cohen Aug. 1985 16 p
(Contract N00014-80-C-0116)
(AD-A158881; TR-22) Avail: NTIS HC A02/MF A01 CSCL 20/11

Of major importance in the determination of residual stress via diffraction is the accuracy of the measurement of the scattering angle (2 theta p) of a Bragg peak. This determines the accuracy of the interplanar (d) spacing and hence the strain and stress. In

the U.S., the most commonly accepted method of determining peak position is a parabolic fit near the top of a peak. (While a diffraction peak is not parabolic, this is a satisfactory function near the maximum.) The error is this procedure has been derived and tested, and it has been shown that a multipoint fit with at least 7 points is rapid and as precise or more precise than the centroid, the bisector of the half width, or cross correlation, except for sharp peaks in which case the centroid or cross correlation are slightly better. Thus a parabolic fit is generally useful and, since a least-squares fit to this function is readily carried out on modern microprocessors, automation of a stress measurement is possible, including evaluation of errors. The parabolic fit has the best overall ability to determine peak positions over a wide range of shapes. A Modified Lorentzian can be quite helpful if only a part of a peak can be explored, especially for sharp peaks. The errors in a Modified Lorentzian fit are not very sensitive to counting time. With a position sensitive detector precision comparable to that for a parabolic fit can be obtained in about one tenth the time. Goodness-of-Fit is not necessarily an accurate gage of error in peak position. GRA

N86-15692# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
LIMIT ANALYSIS OF TRANSVERSELY LOADED GRILLAGES M.S. Thesis
G. A. Harvey Jun. 1985 119 p
(Contract N66314-70-A-0073)
(AD-A158988) Avail: NTIS HC A06/MF A01 CSCL 20/11

A computer program that can determine the collapse load of a transversely loaded grillage that allows for various types of loading and failure modes is presented. The program allows the user to constrain particular grillage members to have fully developed plastic hinges at the location of maximum moment which gives the program the capability to study redundancy of transversely loaded grillages. The lower bound theorem of limit analysis and linear programming techniques are used to determine a grid load factor and provide a failure mode and associated bending moments. A user's guide and program explanation are provided. An example grillage is studied using this program and the load factor and redundancy is discussed. Author (GRA)

N86-15693# Rock Island Arsenal, Ill. Engineering Directorate.
STRESS ANALYSIS ON SCREW THREAD Final Technical Report
A. R. Yao and J. A. Doran Aug. 1984 182 p
(AD-A159347; AD-E700021; SMCRI-EN-84-13) Avail: NTIS HC A09/MF A01 CSCL 13/5

This report documents a thread joint analysis method which has been applied to an interactive computer program for evaluation of thread form deviations encountered in production. Thread forms covered include FED-STD-H28 standards and special forms generated by user supplied input. The analysis method, which includes static and dynamic analysis using elastic theory, provides thread joint performance indicators in the form of static load capacity and fatigue safety factor for various life cycle ranges. The analysis method and subsequent program is also useful for developing thread joint design criteria and verification of existing designs. GRA

N86-15694# Technische Univ., Berlin (West Germany). Fachgebiet Fuegetechnik/Schweisstechnik.
INVESTIGATIONS OF THE RELATIONS BETWEEN THE DAMAGE EVOLUTION OF VIBRATIONALLY LOADED SAMPLES AND THE MEASURING QUANTITIES OF THE INSTRUMENTED ACCELERATED FATIGUE TEST DURING THE CRACKFREE FATIGUE PHASE AND MICROCRACK FORMATION PHASE Final Report [UNTERSUCHUNG DER ZUSAMMENHAENGE ZWISCHEN DEM SCHAEDIGUNGSVERLAUF SCHWINGEND BEANSPRUCHTER PROBEN UND DEN MESSGROESSEN DES INSTRUMENTIERTEN DAUERSCHWINGVERSUCHES IN DER ANRISSFREIEN ERMUEDUNGSPHASE UND DER PHASE DER MIKRORISSBILDUNG]
Lutz Dorn 31 Mar. 1984 360 p refs In GERMAN
(Contract DFG-Do-202/11)
Avail: NTIS HC A16/MF A01

Vibration tests were developed to study load and vibration cycle-dependent material changes. The influence of vibration frequency, loading amplitude, average stress, cooling conditions, and test materials on the characteristics of the damage process were investigated. A high frequency vibration testing machine based on the resonance principle was used. The characteristics were measured and digitally processed, in single step as well as in load increase tests. The results show that the developed instrumentation of the vibration testing machine and of the sample allows to determine material changes during dynamic loading, and relations between loading amplitude and the measured and calculated characteristics of the damage process. Author (ESA)

N86-15300*# Boeing Vertol Co., Philadelphia, Pa.
PLANNING, CREATING AND DOCUMENTING A NASTRAN FINITE ELEMENT MODEL OF A MODERN HELICOPTER
R. Gabal, D. Reed, R. Ricks, and W. Kesack *In* NASA. Ames Research Center Rotorcraft Dynamics 1984 Nov. 1985 p 307-324 refs (For primary document see N86-15280 06-05)
Avail: NTIS HC A21/MF A01 CSCL 20K

N86-15421# Hokkaido Univ., Sapporo (Japan).
DEFORMATION BEHAVIOR OF ANISOTROPIC SAND DURING PRINCIPAL STRESS AXES ROTATION
Kinya Miura, Seiichi Miura, and Shosuke Toki *In its* Bulletin of the Faculty of Engineering, Hokkaido Univ., No. 128 Oct. 1985 39 p refs In JAPANESE; ENGLISH summary (For primary document see N86-15420 06-31)
Avail: NTIS HC A06/MF A01

42 GEOSCIENCES (GENERAL)

N86-15695# Hokkaido Univ., Sapporo (Japan). Dept. of Geophysics.
GEOPHYSICAL BULLETIN OF HOKKAIDO UNIVERSITY, NO. 46
Izumi Yokoyama, ed., Tadaharu Fujiki, ed., Takeo Moriya, ed., Hiroshi Okada, ed., Toshio Harimaya, ed., Kinshiro Nakao, ed., Tsutomu Sasatani, ed., Sei-ichi Kanari, ed., Ichiro Nakanishi, ed., Hideki Shimamura, ed. et al Oct. 1985 91 p refs In JAPANESE; ENGLISH summaries
(ISSN-0439-3503) Avail: NTIS HC A05/MF A01

Several topics in geophysics are discussed. The reduction of the nocturnal cooling value by smudging; the atmospheric electrical environment of sea fog in the Pacific coast of eastern Hokkaido, Japan; and a numerical model of the seasonal variation of the tropical Pacific sea surface temperature are among the topics covered. For individual titles, see N86-15696 through N86-15702.

N86-15696# Hokkaido Univ., Sapporo (Japan). Dept. of Geophysics
THE REDUCTION OF NOCTURNAL COOLING VALUE BY SMUDGING c47
Toshio Harimaya, Masayuki Maki, Katsuhiro Kikuchi, Takashi Taniguchi, Chikashi Hiramatsu, and Satoshi Azumane *In its* Geophysical Bulletin of Hokkaido Univ., No. 46 Oct. 1985 p 1-11 refs In JAPANESE; ENGLISH summary (For primary document see N86-15695 06-42)
Avail: NTIS HC A05/MF A01

The effect of smudging was measured during the observation period of nocturnal cooling in a land basin. Based on the estimation by three kinds of measurements, the effect of smudging produced a difference in temperature of about 2.5 C. Consequently, frost formation was prevented at the bottom of the Akaigawa Basin. Based on the consideration of increasing further benefits of smudging, it was shown that the reduction rate increased if the duration of smudge layer is longer and the effect increased if the onset time of smudging is earlier. In addition, it was shown that

the smudge layer containing natural fog droplets was superior to that of smudge alone. Topography of the land basin likewise raised the effect by nondispersion of the smudge layer. Author

N86-15697# Hokkaido Univ., Sapporo (Japan). Meteorological Lab.

OBSERVATIONS ON THE ATMOSPHERIC ELECTRICAL ENVIRONMENT OF SEA FOG IN THE PACIFIC COAST OF EASTERN HOKKAIDO, JAPAN **c47**

Masashi Yoshihiro, Takashi Taniguchi, and Katsuhiro Kikuchi *In its* Geophysical Bulletin of Hokkaido Univ., No. 46 Oct. 1985 p 13-31 refs In JAPANESE; ENGLISH summary (For primary document see N86-15695 06-42)
Avail: NTIS HC A05/MF A01

Observations of sea fogs were carried out at the Cape Aikappu in Akkeshi (43 01N, 144 51 E) located on the coast of the Pacific Ocean, Eastern Hokkaido, Japan from July 15 to July 26, 1983. One of the main purposes of the observations was to know the atmospheric electrical nature of sea fogs of which very little is known to date. Throughout the observation period, the atmospheric electric field, atmospheric electrical conductivity, air-earth current, total space charge, electric charges on precipitation particles, horizontal visibility, heights of inversion layer and other meteorological factors were measured. Fog droplets were sampled to examine the size distribution, liquid water content and elemental compositions of the nuclei using an energy dispersive X-ray microanalyzer. In view of the characteristics of time variation of the horizontal visbility, the fog events were divided into two types. One of them as the advection fog which was generated along the sea side and on the Pacific Ocean, and advected to the observation site, and the other was the radiation fog which was generated around the observation site. It was concluded that: (1) time variations of the atmospheric electric field during fog events was influenced by condensation-evaporation effects on fog droplets and the change of depth of the fog layer; (2) in advection fog, positive electrical conductivity decreased, and was inversely proportional to the total surface area of fog droplets per unit volume of the atmosphere; and (3) the condensation nuclei of the advection fog were probably combustion products and sea salt particles. R.J.F.

N86-15698# Hokkaido Univ., Sapporo (Japan). Dept. of Geophysics.

A NUMERICAL STUDY ON THE RESPONSE OF THE TROPICAL PACIFIC SEA SURFACE TEMPERATURE TO A SUDDEN CHANGE OF WIND STRESS **c48**

Kensuke Takeuchi *In its* Geophysical Bulletin of Hokkaido Univ., No. 46 Oct. 1985 p 33-41 refs In JAPANESE; ENGLISH summary (For primary document see N86-15695 06-42)
Avail: NTIS HC A05/MF A01

Responses of sea surface temperature in the tropical Pacific Ocean to a sudden change of wind stress is examined using a multi-level numerical model. The model ocean is a rectangular basin with a flat bottom, and is driven by steady wind stress until a quasi-stational state is attained, at which time eastward windstress is added suddenly in the eastern portion of the model ocean. Sea surface temperature around the Equator in the central and eastern portion of the model ocean increases by up to 3.5 degrees. Analysis of the result show that the increase of sea surface temperature in the central area is due to advection by eastward current associated with eastward propagating internal equatorial Kelvin waves excited by the change of wind stress, while in the area near the eastern boundary, along with the zonal advection, deepending of the thermocline and resulting reduction of equatorial upwelling also play important roles. It is also shown that it is the first vertical mode which is mostly responsible for the variation of the sea surface temperature. Author

N86-15699# Hokkaido Univ., Sapporo (Japan). Dept. of Geophysics.

A NUMERICAL MODELLING OF THE SEASONAL VARIATION OF THE TROPICAL PACIFIC SEA SURFACE TEMPERATURE **c48**

Kensuke Takeuchi *In its* Geophysical Bulletin of Hokkaido Univ., No. 46 Oct. 1985 p 43-52 refs In JAPANESE; ENGLISH summary (For primary document see N86-15695 06-42)
Avail: NTIS HC A05/MF A01

Responses of the tropical Pacific Ocean to seasonally changing wind stress are examined by a numerical experiment, in an attempt to throw light upon mechanisms behind seasonal variations of sea surface temperature in this region. The model ocean is nearly the same as one used in Takeuchi(1985) except for a wider zonal dimension, and the seasonal change of wind stress is idealized as north-south migration of a wind system. The model results show basically good agreements with observations, including development of a cold water tongue extending along the equator from the eastern boundary in the season from northern summer to autumn and shrinking from winter to spring. Analysis of the results show that the origin of the cold water of the cold water tongue is several hundreds kilometer south of the equator along the eastern boundary, where a intense coastal upwelling takes place slightly earlier than the development of the cold water tongue. The seasonal variation of the coastal upwelling is attributed to both changes in local meridional wind stress and remotely forced equatorial Kelvin waves. Author

N86-15700# Hokkaido Univ., Sapporo (Japan). Dept. of Geophysics.

A NUMERICAL SIMULATION OF COASTAL MIXED LAYER BY A MODIFIED 1-D DKT MODEL **c48**

Sei-ichi Kanari and Momoki Koga *In its* Geophysical Bulletin of Hokkaido Univ., No. 46 Oct. 1985 p 53-68 refs In JAPANESE; ENGLISH summary (For primary document see N86-15695 06-42)
Avail: NTIS HC A05/MF A01

A modified DKT (Denman, Kraus and Turner) model was applied to the coastal mixed layer 5 km off the Oshore, in Ishikari Bay, Hokkaido. Modification of the model was made by adding advective effects and wind-depending penetration coefficient of short wave radiation in sea water. Input data used in the model simulation were abtained by a moored Meteo-oceanographic Spar Buoy with a 11-sensors thermister chain of 20 m long. Estimate of horizontal advection and vertical flow were based on the Csnady's inertial response model for wind-induced coastal currents. The advection model with constant horizontal temperature gradient showed that the observed rapid temperature drop was due to coastal upwelling induced by an atmospheric low pressure passing. However, successive rapid SST recovery could not be reproduced by the above constant gradient model. The recovery was attained by assuming a temporal reversal horizontal temperature gradient after passing the low pressure. In this case, standard error of simulated mixed layer temperature was plus or minus 0.8 C throughout 40 days. Author

N86-15701# Hokkaido Univ., Sapporo (Japan). Dept. of Geophysics.

A STUDY OF THE STRONG GROUND MOTION OF THE WESTERN HIDAKA, HOKKAIDO EARTHQUAKE **c46**

Tsutomu Sasatani *In its* Geophysical Bulletin of Hokkaido Univ., No. 46 Oct. 1985 p 69-83 refs In JAPANESE; ENGLISH summary (For primary document see N86-15695 06-42)
Avail: NTIS HC A05/MF A01

An attempt is made to model strong ground motion from the western Hidaka earthquake of January 23, 1981. First, the source parameters for this event are obtained from a study of teleseismic P and S waves. Parameter values are: focal depth = 110 km, fault strike = 248, dip angle = 80, rake angle = 97, source process time = 3-4 sec, and seismic moment = 2.2 x 10 to the 26th power dyne-cm. Then synthetic strong-motion seismograms are calculated for the source parameters obtained and the assumed plane-layered earth model. These seismograms are compared with the observed JMA strong-motion seismograms at seven stations in Hokkaido. The duration and amplitude behavior of observed strong-motion can be explained by the simple source and earth models, except data from Tomakomai, Urakawa and Obihiro whose observed seismograms show waves with abnormally large amplitude after the direct S wave arrival. These abnormal strong-motions

may be due to propagational effects introduced by local crustal structure. Author

N86-15702# Hokkaido Univ., Sapporo (Japan). Research Center for Earthquake Prediction.
SEISMIC INTENSITY SURVEY AND HYPOCENTER RECALCULATION ON THE 1985 SAPPORO EARTHQUAKE (M 3.5) c46
Sadaomi Suzuki and Yoshinobu Motoya *In its* Geophysical Bulletin of Hokkaido Univ., No. 46 Oct. 1985 p 85-91 refs In JAPANESE; ENGLISH summary (For primary document see N86-15695 06-42)
Avail: NTIS HC A05/MF A01

A felt earthquake (M 3.5) occurred under Sapporo city on January 23, 1985. Recalculation of the earthquake hypocenter assigned the parameters: origin time = 07h33m07.8s, latitude = 42 59.1 N, longitude = 141 22.6 E, depth = 11 km. One of the best focal mechanism solutions shows a P-axis dipping 25 toward N64 R. A questionnaire survey was carried out on this earthquake and distribution of seismic intensity was determined from ninety two answers of dwellers in Sapporo and its environs. Felt area extends to mountain area in the southwest of Sapporo and to Ishikari town in the north of Sapporo. An area of intensity 2 in JMA scale was found near the epicenter, Toyohira-ku in Sapporo. Author

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N86-15703*# Pacific Northwest Lab., Richland, Wash.
LANDSAT TM IMAGE DATA QUALITY ANALYSIS FOR ENERGY-RELATED APPLICATIONS Final Report
George E. Wukelic, H. P. Foote, G. M. Petrie, J. C. Barnard, and J. R. Eliason Aug. 1985 21 p Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(NASA Order S-12402-C; Contract KC-04-03-03-87070)
(E86-10009; NASA-CR-176268; NAS 1.26:176268; PNL-5572)
Avail: NTIS HC A02/MF A01 CSCL 08G

This project represents a no-cost agreement between National Aeronautic Space Administration Goddard Space Flight Center (NASA GSFC) and the Pacific Northwest Laboratory (PNL). PNL is a Department of Energy (DOE) national laboratory operted by Battelle Memorial Institute at its Pacific Northwest Laboratories in Richland, Washington. The objective of this investigation is to evaluate LANDSAT's thematic mapper (TM) data quality and utility characteristics from an energy research and technological perspective. Of main interest is the extent to which repetitive TM data might support DOE efforts relating to siting, developing, and monitoring energy-related facilities, and to basic geoscientific research. The investigation utilizes existing staff and facility capabilities, and ongoing programmatic activities at PNL and other DOE national laboratories to cooperatively assess the potential usefulness of the improved experimental TM data. The investigation involves: (1) both LANDSAT 4 and 5 TM data, (2) qualitative and quantitative use consideration, and 3) NASA P (corrected) and A (uncorrected) CCT analysis for a variety of sites of DOE interest. Initial results were presented at the LANDSAT Investigator's Workshops and at specialized LANDSAT TM sessions at various conferences. Author

N86-15704*# Minnesota Univ., Minneapolis.
PEAT LANDFORMS ALONG THE ALBANY RIVER, NORTHERN ONTARIO. AN ECOLOGICAL STUDY OF PEAT LANDFORMS IN CANADA AND ALASKA Progress Report
Paul H. Glaser 1985 20 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract NAS5-28740)
(E86-10014; NASA-CR-176429; NAS 1.26:176429) Avail: NTIS HC A02/MF A01 CSCL 08B

During the summer of 1985 a field investigation was started in the Hudson Bay lowland region of northern Ontario, which represents the largest expanse of peatland in North America and is an important sink in the global carbon cycle. A key area in the lowlands is situated along the Albany River near the confluence of the Chepay River. Here the striking vegetation-landforms are transitional between those found on the bed of Glacial Lake Agassiz in northern Minnesota and southern Manitoba and the more northern peatlands in the Hudson Bay lowland region. In peatland studies elsewhere the landform patterns have been used not only to classify different peatland types but also as an indicator of potential developmetnal trends. The study area is generally defined by that covered by the TM scene E-40062-15532 taken on Sept. 16, 1982. The purpose of the field work is to acquire sufficent information to interpret the TM imagery and test various hypotheses on peatland develpment on the gasis of the pattern transitions. Author

N86-15705*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
BIOCHEMICAL PROCESSES IN SAGEBRUSH ECOSYSTEMS: INTERACTIONS WITH TERRAIN Semiannual Report
Pamela Matson, Principal Investigator, William Reiners (Wyoming Univ.), and Laurence Strong (Technicolor Government Services, Inc.) 10 Dec. 1985 11 p ERTS
(E86-10015; NASA-TM-87508; NAS 1.15:87508) Avail: NTIS HC A02/MF A01 CSCL 08B

The objectives of a biogeochemical study of sagebrush ecosystems in Wyoming and their interactions with terrain are as follows: to describe the vegetational pattern on the landscape and elucidate controlling variables, to measure the soil properties and chemical cycling properties associated with the vegetation units, to associate soil properties with vegetation properties as measured on the ground, to develop remote sensing capabilities for vegetation and surface characteristics of the sagebrush landscape, to develop a system of sensing snow cover and indexing seasonal soil to moisture; and to develop relationships between temporal Thematic Mapper (TM) data and vegetation phenological state. F.M.R.

N86-15706*# Delaware Univ., Newark. Coll. of Marine Studies.
EVALUATION OF SPATIAL, RADIOMETRIC AND SPECTRAL THEMATIC MAPPER PERFORMANCE FOR COASTAL STUDIES Final Project Report
Vytautas Klemas, Steven G. Ackleson, and Michael A. Hardisky 30 Nov. 1985 59 p refs ERTS
(Contract NAS5-27580)
(E86-10016; NASA-CR-176427; NAS 1.26:176427) Avail: NTIS HC A04/MF A01 CSCL 08B

On 31 March 1983, the University of Delaware's Center for Remote Sensing initiated a study to evaluate the spatial, radiometric and spectral performance of the LANDSAT Thematic Mapper for coastal and estuarine studies. The investigation was supported by Contract NAS5-27580 from the NASA Goddard Space Flight Center. The research was divided into three major subprojects: (1) a comparison of LANDSAT TM to MSS imagery for detecting submerged aquatic vegetation in Chesapeake Bay; (2) remote sensing of submerged aquatic vegetation - a radiative transfer approach; and (3) remote sensing of coastal wetland biomass using Thematic Mapper wavebands. For individual titles, see N86-15707 through N86-15709.

N86-15707*# Delaware Univ., Newark. Coll. of Marine Studies.
A COMPARISON OF LANDSAT TM TO MSS IMAGERY FOR DETECTING SUBMERGED AQUATIC VEGETATION IN LOWER CHESAPEAKE BAY
Steven G. Ackleson and Vytautas Klemas *In its* Evaluation of Spatial, Radiometric and Spectral Thematic Mapper Performance for Coastal Studies 30 Nov. 1985 17 p refs Presented at the ACSM-ASPRS Fall Convention, Indianapolis, Ind., 8-13 Sep. 1985 ERTS (For primary document see N86-15706 06-43)

Avail: NTIS HC A04/MF A01 CSCL 08J

LANDSAT Thematic Mapper (TM) and Multispectral Scanner (MSS) imagery generated simultaneously over Guinea Marsh, Virginia, are assessed in the ability to detect submerged aquatic, bottom-adhering plant canopies (SAV). An unsupervised clustering algorithm is applied to both image types and the resulting classifications compared to SAV distributions derived from color aerial photography. Class confidence and accuracy are first computed for all water areas and then only shallow areas where water depth is less than 6 feet. In both the TM and MSS imagery, masking water areas deeper than 6 ft. resulted in greater classification accuracy at confidence levels greater than 50%. Both systems perform poorly in detecting SAV with crown cover densities less than 70%. On the basis of the spectral resolution, radiometric sensitivity, and location of visible bands, TM imagery does not offer a significant advantage over MSS data for detecting SAV in Lower Chesapeake Bay. However, because the TM imagery represents a higher spatial resolution, smaller SAV canopies may be detected than is possible with MSS data. Author

N86-15708*# Delaware Univ., Newark. Coll. of Marine Studies.
REMOTE RECONNAISSANCE OF SUBMERGED AQUATIC VEGETATION: A RADIATIVE TRANSFER APPROACH
Steven G. Ackleson and Vytautas Klemas *In its* Evaluation of Spatial, Radiometric and Spectral Thematic Mapper Performance for Coastal Studies 30 Nov. 1985 17 p refs Presented at the 3rd LANDSAT-4 Workshop, Greenbelt, Md., 6-7 Dec. 1983 ERTS (For primary document see N86-15706 06-43)
Avail: NTIS HC A04/MF A01 CSCL 08J

The effectiveness of LANDSAT TM and MSS sensors for detecting submerged aquatic vegetation (SAV) is assessed. The problem is approached from a theoretical standpoint in which volume reflectance from SAV under a variety of conditions is simulated. The focus is on the spectral and radiometric qualities of TM bands 1, 2 and 3 and MSS bands 4 and 5. Author

N86-15709*# Delaware Univ., Newark. Coll. of Marine Studies.
REMOTE SENSING OF COASTAL WETLANDS BIOMASS USING THEMATIC MAPPER WAVEBANDS
Michael A. Hardisky and Vytautas Klemas *In its* Evaluation of Spatial, Radiometric and Spectral Thematic Mapper Performance for Coastal Studies 30 Nov. 1985 19 p refs Presented at the LANDSAT-4 Science Characterization Early Results Symposium, Greenbelt, Md., 23-24 Feb. 1984 Previously announced as N85-23198 ERTS (For primary document see N86-15706 06-43)
Avail: NTIS HC A04/MF A01 CSCL 13B

Spectral data, simulating thematic mapper bands 3, 4 and 5 are gathered in salt and brackish marshes using a hand-held radiometer. Simple regression models are developed equating spectral radiance indices with total live biomass for S. alterniflora in a salt marsh and for a variety of plant species in a brackish marsh. Models are then tested using an independent set of data and compared to harvest estimates of biomass. In the salt marsh, biomass estimates from spectral data are similar to harvest biomass estimates during most of the growing season. Estimates of annual net aerial primary productivity calculated from spectral data are within 21% of production estimated from harvest data. During August, biomass estimates from spectral data in the brackish marsh are similar to biomass estimated by harvesting techniques. At other times during the growing season, spectral data estimates of biomass are not always comparable to harvest biomass estimates. Reasonable estimates of wetlands biomass are possible during the peak of the growing season (August) using spectral data similar to thematic mapper bands 3, 4 and 5 gathered with hand-held radiometers. Author

N86-15710*# Arizona Univ., Tucson.
LANDSAT-4 THEMATIC MAPPER MODULATION TRANSFER FUNCTION (MTF) EVALUATION Progress Report, 15 Dec. 1983 - 15 Mar. 1984
Robert Schowengerdt, Principal Investigator 5 Apr. 1985 6 p ERTS
(E86-10017; NASA-CR-176426; NAS 1.26:176426) Avail: NTIS HC A02/MF A01 CSCL 08B

The Modulation Transfer Function (MTF) for thematic mapping (TM) bands 3, 4, 5 and 7 is reliably estimated with the San Mateo Bridge target in the 12/31/82 scene. These results are to be compared with those from the 8/12/83 scene. Bands 1, 2 and 6 are to be analyzed with a different target possessing greater contrast. This may be possible with the underflight data comparisón currently underway. The registration of this data to the TM image of 8/12/83 for a region arround the Stockton sewage pond east of San Francisco has begun. This particular approach has the advantage that the full two-dimensional MFT will be measured instead of the MFT in only one azimuth as reported. Author

N86-15711*# State Univ. of New York, Syracuse.
SYSTEMATIC AND RANDOM VARIATIONS IN DIGITAL THEMATIC MAPPER DATA Final Report
Michael J. Duggin, Principal Investigator and H. Sakhavat 1985 68 p refs Original contains imagery. Original phototgraphy may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract NAS5-27595)
(E86-10018; NASA-CR-176425; NAS 1.26:176425) Avail: NTIS HC A04/MF A01 CSCL 08B

Radiance recorded by any remote sensing instrument will contain noise which will consist of both systematic and random variations. Systematic variations may be due to sun-target-sensor geometry, atmospheric conditions, and the interaction of the spectral characteristics of the sensor with those of upwelling radiance. Random variations in the data may be caused by variations in the nature and in the heterogeneity of the ground cover, by variations in atmospheric transmission, and by the interaction of these variations with the sensing device. It is important to be aware of the extent of random and systematic errors in recorded radiance data across ostensibly uniform ground areas in order to assess the impact on quantative image analysis procedures for both the single date and the multidate cases. It is the intention here to examine the systematic and the random variations in digital radiance data recorded in each band by the thematic mapper over crop areas which are ostensibly uniform and which are free from visible cloud. Author

N86-15712# Committee on Science and Technology (U. S. House).
BIOTECHNOLOGY AND AGRICULTURE
Washington GPO 1985 359 p Hearings before the Subcommittee on Investigations and Oversight of the Committee on Science and Technology, 99th Congression, 1st Session, no. 18, 16-7 Apr. 1985
(GPO-48-672) Avail: Subcommittee on Investigations and Oversight

The U.S. House of Representatives's subcommittee on investigations and oversight held hearings on biotechnology and agricultural sciences research programs. Advances in biotechnology research in agriculture and the direction of future research are reported. New capabilities in molecular biology, involving recombinant DNA methodologies are outlined. Applications of biotechnology to benefit agriculture, forestry, natural resources, animal production, and the related industrial processes are emphasized. E.A.K.

N86-15713# SRI International Corp., Menlo Park, Calif.
COMPUTER VISION RESEARCH AND ITS APPLICATIONS TO AUTOMATED CARTOGRAPHY Semiannual Technical Report, 11 Jun. 1984 - 10 Jun. 1985
M. A. Fischler Sep. 1985 204 p
(Contract MDA903-83-C-0027; ARPA Order 3862)
(AD-A159435; TR-4/5) Avail: NTIS HC A10/MF A01 CSCL 09/2

The SRI Image Understanding program is a broad effort spanning the entire range of machine vision research. Its three major concerns are: (1) to develop an understanding of the physics and mathematics of the vision process, (2) to develop a knowledge-based framework for integrating and reasoning about sensed (imaged) data, and (3) to develop a machine-based

environment for effective experimentation, demonstration, and evaluation of our theoretical results, as well as providing a vehicle for technology transfer. This report describes recent process in all three areas. In particular, we describe progress in constructing and testing a state-of-the-art automated system for stereo compilation, new approaches to extracting depth and structural information from imaged data, a knowledge-based system for feature extraction, and tools for scene modeling and interaction with a machine terrain data base. Author (GRA)

N86-15714# Pacific Northwest Lab., Richland, Wash.
APPROACH TO UNCERTAINTY ASSESSMENT FOR FLUID FLOW AND CONTAMINANT TRANSPORT MODELING IN HETEROGENEOUS GROUNDWATER SYSTEMS
R. W. Nelson, E. A. Jacobson, and W. Conbere Jun. 1985 24 p refs Presented at NATO Advanced Study Institute on Fundamentals of Transport Phenomena in Porous Media, Newark, Del., 14 Jul. 1985
(Contract DE-AC06-76RL-01830)
(DE85-016621; PNL-SA-13282; CONF-850780-1) Avail: NTIS HC A02/MF A01

There is a growing awarneness of the need to quantify uncertainty in groundwater flow and transport model results. regulatory organizations are beginning to request the statistical distributions of predicted contaminant arrival to the biosphere, so that realistic confidence intervals can be obtained for the modeling results. To meet these needs, methods are being developed to quantify uncertainty in the subsurface flow and transport analysis sequence. A method for evaluating this uncertainty, described in this paper, considers uncertainty in material properties and was applied to an example field problem. Our analysis begins by using field measurements of transmissivity and hydraulic head in a regional, parameter estimation method to obtain a calibrated fluid flow model and a covariance matrix of the parameter estimation errors. The calibrated model and the covariance matrix are next used in a conditional simulation mode to generate a large number of head realizations. The specific pore water velocity distribution for each realization is calculated from the effective porosity, the aquifer parameter realization, and the associated head values. Each velocity distribution is used to obtain in a transport solution for a contaminant originating from the same source for all realizations. The results are the statistical distributions for the outflow arrival times. The confidence intervals for contamination reaching the biosphere are obtained from the outflow statistical distributions.
DOE

N86-15715# Helsinki Univ. (Finland). Radio Lab.
FORMULAS CONCERNING NONELECTRICAL PROPERTIES OF SNOW: THE ELECTRICAL ENGINEER'S POINT OF VIEW
Ari Sihvola 1984 12 p refs
(Rept-S-156; ISBN-951-753-271-7; ISSN-0355-5712) Avail: NTIS HC A02/MF A01

The nonelectrical properties of snow most commonly used in snow research reports are discussed. Density, wetness, water equivalent, dry density, porosity, void ratio, saturation, and the depolarization factors of the ice and water grains are considered.
Author (ESA)

N86-15716# Helsinki Univ. (Finland). Radio Lab.
MICROWAVE RADIOMETERS FOR REMOTE SENSING APPLICATIONS
Martti Tiuri 1984 8 p refs Presented at Specialist Meeting on Microwave Radiometry and Remote Sensing Applications, Rome, Italy, 1-2 Mar. 1983
(Rept-S-157; ISBN-951-753-273-3; ISSN-0355-5712) Avail: NTIS HC A02/MF A01

Dicke radiometer, noise injection radiometer and total power radiometers used in remote sensing are described. The achievable temperature resolution and the absolute accuracy of the brightness temperature measurement are discussed. A remote sensing radiometer for oil slick detection is described.
Author (ESA)

N86-15717# Helsinki Univ. (Finland). Radio Lab.
MIXING FORMULAS AND EXPERIMENTAL RESULTS OF THE DIELECTRIC CONSTANT OF SNOW
Ari Sihvola, Ebbe Nyfors, and Martti Tiuri 1984 27 p refs
(Rept-S-158; ISBN-951-753-274-1; ISSN-0355-5712) Avail: NTIS HC A03/MF A01

Dielectric properties of snow according to dielectric models are compared to experimental results. The complex permittivity of wet snow is assumed to consist of two parts: the sum of the permittivity of dry snow (a mixture of ice and air) and the excess permittivity due to liquid water (resulting from the dielectric mixture of water and air). The effect of liquid water is considered. Exponential models and structure-dependent models based on mixture theories are applied. It is shown that the assumptions of water inclusions having the form of either randomly oriented disks, needles, or spheres do not get empirical confirmation, but the inclusions are preferably prolate ellipsoids (ellipticity 0.16) or oblate ellipsoids (ellipticity 0.12), dry snow being a dielectric mixture of randomly oriented disk-shaped ice particles and air.
Author (ESA)

N86-15718# Wageningen Agricultural Univ. (Netherlands). Faculty Advisory Commission.
IMAGE REGISTRATION Final Report [BEELDREGISTRATIE]
28 Jan. 1985 97 p In DUTCH
Avail: NTIS HC A05/MF A01

Introduction of a speciality in image registration to an agricultural college syllabus is examined. Utility within agricultrual research is investigated. Introduction is advised. Author (ESA)

N86-15719# Geological Survey, Columbus, Ohio. Water Resources Div.
WATER RESOURCES DATA FOR OHIO, WATER YEAR 1984. VOLUME 2: ST. LAWRENCE RIVER BASIN, STATEWIDE PROJECT DATA Annual Report, 1 Oct. 1983 - 30 Sep. 1984
H. L. Shindel, L. L. Stewart, and J. R. Kolva Apr. 1985 235 p
(PB85-230233; USGS/WDR/OH-84/2-Vol-2;
USGS/WRD/HD-85/223-Vol-2) Avail: NTIS HC A11/MF A01 CSCL 08H

Water resources data for the 1984 water year for Ohio consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels and water quality of groundwater wells. Records for water discharge at 127 gaging stations, stage and contents at four lakes and reservoirs, water quality at 31 gaging stations, 32 wells, and 14 partial record sites, and water levels at 387 observation wells are reported. Also included are data from 60 crest-stage partial-record stations and four miscellaneous sites. GRA

N86-15720# Geological Survey, Sacramento, Calif.
WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1983. VOLUME 3: SOUTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM WALKER RIVER TO TRUCKER RIVER Annual Report, 1 Oct. 1982 - 30 Sep. 1983
R. P. Fogelman, T. C. Hunter, J. R. Mullen, W. G. Simpson, and D. A. Grillo Mar. 1985 408 p Prepared in cooperation with California State Dept. of Water Resources, Sacramento, California
(PB85-232312; USGS/WDR/CA-83/3-Vol-3;
USGS/WRD/HD-85/218-Vol-3) Avail: NTIS HC A18/MF A01 CSCL 08H

Water resources data for the 1983 water year for California consists of records of stage, discharge, gage-height, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and quality of water in wells. Discharge records for 159 gaging stations; stage contents for 41 lakes and reservoirs; gage height records for two lakes; water quality for 6 streams and 46 wells; and water levels for 99 observation wells are reported. GRA

N86-15721# Geological Survey, Tacoma, Wash. Water Resources Div.
WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1982. VOLUME 2: EASTERN WASHINGTON Annual Water-

Data Report, 1 Oct. 1981 - 30 Sep. 1982
Mar. 1985 224 p
(PB85-236834; USGS/WRD/HD-85/221-Vol-2; USGS/WDR/WA-82/2-Vol-2) Avail: NTIS HC A10/MF A01 CSCL 08H

Water resources data for the 1982 water year for Washington consist of: (1) records of stage, discharge, and water quality of streams, (2) stage, contents, and water quality of lakes and reservoirs; and (3) water levels and water quality of wells and springs. Discharge records for 253 gaging stations; stage only records for 8 gaging stations; stage and contents for 37 lakes and reservoirs; water quality for 81 gaging stations; and water levels for 57 observation wells are reported. Also included are data for 33 crest-stage partial-record stations. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N86-15722*# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.
MOD-5A WIND TURBINE GENERATOR PROGRAM DESIGN REPORT. VOLUME 2: CONCEPTUAL AND PRELIMINARY DESIGN, BOOK 1 Final Report, Jul. 1980 - Jun. 1984
Aug. 1984 374 p 10 Vol.
(Contracts DEN3-153; DE-AI01-79ET-20305)
(NASA-CR-174735-Vol-2-Bk-1; DOE/NASA/0153-Vol-2-Bk-1; NAS 1.26:174735-Vol-2-Bk-1; Doc-84AEPD004-Vol-2-Bk-1) Avail: NTIS HC A16/MF A01 CSCL 10B

The design, development and analysis of the 7.3 MW MOD-5A wind turbine generator is documented. There are four volumes. In Volume 2, book 1 the requirements and criteria for the design are presented. The conceptual design studies, which defined a baseline configuration and determined the weights, costs and sizes of each subsystem, are described. The development and optimization of the wind turbine generator are presented through the description of the ten intermediate configurations between the conceptual and final designs. Analyses of the system's load and dynamics are presented. Author

N86-15723*# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.
MOD-5A WIND TURBINE GENERATOR PROGRAM DESIGN REPORT. VOLUME 2: CONCEPTUAL AND PRELIMINARY DESIGN, BOOK 2 Final Report, Jul. 1980 - Jun. 1984
Aug. 1984 788 p refs 10 Vol.
(Contracts DEN3-153; DE-AI01-79ET-20305)
(NASA-CR-174735-Vol-2-Bk-2; DOE/NASA/0153-Vol-2-Bk-2; NAS 1.26:174735-Vol-2-Bk-2; Doc-84AEPD004-Vol-2-Bk-2) Avail: NTIS HC A99/MF E03 CSCL 10B

The design, development and analysis of the 7.3 MW MOD-5A wind tunnel generator is documented. There are four volumes. In Volume 2, book 2 the requirements and criteria for the design are presented. The development tests, which determined or characterized many of the materials and components of the wind turbine generator, are described. Author

N86-15724*# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.
MOD-5A WIND TURBINE GENERATOR PROGRAM DESIGN REPORT. VOLUME 3: FINAL DESIGN AND SYSTEM DESCRIPTION, BOOK 1 Final Report, Jul. 1980 - Jun. 1984
Aug. 1984 574 p 10 Vol.
(Contracts DEN3-153; DE-AI01-79ET-20305)
(NASA-CR-174735-Vol-3-Bk-1; DOE/NASA/0153-Vol-3-Bk-1; NAS 1.26:174735-Vol-3-Bk-1; Doc-84AEPD004-Vol-3-Bk-1) Avail: NTIS HC A24/MF A01 CSCL 10B

The design, development and analysis of the 7.3 MW MOD-5A wind turbine generator is documented. Volume 3, book 1 describes the performance and characteristics of the MOD-5A wind turbine generator in its final configuration. Each subsystem - the rotor, drivetrain, nacelle, tower and foundation is described in detail. Author

N86-15725*# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.
MOD-5A WIND TURBINE GENERATOR PROGRAM DESIGN REPORT. VOLUME 3: FINAL DESIGN AND SYSTEM DESCRIPTION, BOOK 2 Final Report, Jul. 1980 - Jun. 1984
Aug. 1984 571 p 10 Vol.
(Contracts DEN3-153; DE-AI01-79ET-20305)
(NASA-CR-174735-Vol-3-Bk-2; DOE/NASA/0153-Vol-3-Bk-2; NAS 1.26:174735-Vol-3-Bk-2; Doc-84AEPD004-Vol-3-Bk-2) Avail: NTIS HC A24/MF A01 CSCL 10B

The design, development and analysis of the 7.3MW MOD-5A wind turbine generator is documented. The report is divided into four volumes: Volume 1 summarizes the entire MOD-5A program, Volume 2 discusses the conceptual and preliminary design phases, Volume 3 describes the final design of the MOD-5A, and Volume 4 contains the drawings and specifications developed for the final design. Volume 3, book 2 describes the performance and characteristics of the MOD-5A wind turbine generator in its final configuration. The subsystem for power generation, control, and instrumentation subsystems is described in detail. The manufacturing and construction plans, and the preparation of a potential site on Oahu, Hawaii, are documented. The quality assurance and safety plan, and analyses of failure modes and effects, and reliability, availability and maintainability are presented. Author

N86-15726*# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.
MOD-5A WIND TURBINE GENERATOR PROGRAM DESIGN REPORT. VOLUME 4: DRAWINGS AND SPECIFICATIONS, BOOK 1 Final Report, Jul. 1980 - Jun. 1984
Aug. 1984 737 p refs 10 Vol.
(Contracts DEN3-153; DE-AI01-79ET-20305)
(NASA-CR-174735-Vol-4-Bk-1; DOE/NASA/0153-Vol-4-Bk-1; NAS 1.26:174735-Vol-4-Bk-1; Doc-84AEPD004-Vol-4-Bk-1) Avail: NTIS HC A99/MF E03 CSCL 10B

The design, development and analysis of the 7.3 MW MOD-5A wind turbine generator is documented. Volume 4 contains the drawings and specifications that were developed in preparation for building the MOD-5A wind turbine generator. This is the first of five books of volume four. It contains structural design criteria, generator step-up transformer specs, specs for design, fabrication and testing of the system, specs for the ground control enclosure, systems specs, slip ring specs, and control system specs. E.R.

N86-15727*# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.
MOD-5A WIND TURBINE GENERATOR PROGRAM DESIGN REPORT. VOLUME 4: DRAWINGS AND SPECIFICATIONS, BOOK 2 Final Report, Jul. 1980 - Jun. 1984
Aug. 1984 450 p In NEPALI 10 Vol.
(Contracts DEN3-153; DE-AI01-79ET-20305)
(NASA-CR-174735-Vol-4-Bk-2; DOE/NASA/0153-Vol-4-Bk-2; NAS 1.26:174735-Vol-4-Bk-2; Doc-84AEPD004-Vol-4-Bk-2) Avail: NTIS HC A19/MF A01 CSCL 10B

The design, development and analysis of the 7.3 MW MOD-5A wind turbine generator is documented. There are four volumes. This volume contains the drawings and specifications that were developed in preparation for building the MOD-5A wind turbine generator. This is the second book of volume four. Some of the items it contains are specs for the emergency shutdown panel, specs for the simulator software, simulator hardware specs, site operator terminal requirements, control data system requirements,

software project management plan, elastomeric teeter bearing requirement specs, specs for the controls electronic cabinet, and specs for bolt pretensioning. E.R.

N86-15728*# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.
MOD-5A WIND TURBINE GENERATOR PROGRAM DESIGN REPORT. VOLUME 4: DRAWINGS AND SPECIFICATIONS, BOOK 3 Final Report, Jul. 1980 - Jun. 1984
Aug. 1984 542 p 10 Vol.
(Contracts DEN3-153; DE-AI01-79ET-20305)
(NASA-CR-174735-Vol-4-Bk-3; DOE/NASA/0153-Vol-4-Bk-3; NAS 1.26:174735-Vol-4-BK-3; Doc-84AEPD004-Vol-4-Bk-3) Avail: NTIS HC A23/MF A01 CSCL 10B

The design, development and analysis of the 7.3 MW MOD-5A wind turbine generator is documented. This volume contains the drawings and specifications developed for the final design. This volume is divided into 5 books of which this is the third, containing drawings 47A380074 through 47A380126. A full breakdown parts listing is provided as well as a where used list. E.R.

N86-15729*# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.
MOD-5A WIND TURBINE GENERATOR PROGRAM DESIGN REPORT. VOLUME 4: DRAWINGS AND SPECIFICATIONS, BOOK 4 Final Report, Jul. 1980 - Jun. 1984
Aug. 1984 622 p 10 Vol.
(Contracts DEN3-153; DE-AI01-79ET-20305)
(NASA-CR-174735-Vol-4-Bk-4; DOE/NASA/0153-Vol-4-Bk-4; NAS 1.26:174735-Vol-4-Bk-4; Doc-84AEPD004-Vol-4-Bk-4) Avail: NTIS HC A99/MF E03 CSCL 10B

The design, development and analysis of the 7.3 MW MOD-5A wind turbine generator are documented. There are four volumes. This volume contains the drawings and specifications that were developed in preparation for building the MOD-5A wind turbine generator. This volume contains 5 books of which this is the fourth, providing drawings 47A380128 through 47A387125. In addition to the parts listing and where-used list, the logic design of the controller software and the code listing of the controller software are provided. Also given are the aerodynamic profile coordinates. E.R.

N86-15730*# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.
MOD-5A WIND TURBINE GENERATOR PROGRAM DESIGN REPORT. VOLUME 4: DRAWINGS AND SPECIFICATIONS, BOOK 5 Final Report, Jul. 1980 - Jun. 1984
Aug. 1984 403 p 10 Vol.
(Contracts DEN3-153; DE-AI01-79ET-20305)
(NASA-CR-174735-Vol-4-Bk-5; DOE/NASA/0153-Vol-4-Bk-5; NAS 1.26:174735-Vol-4-Bk-5; Doc-84AEPD004-Vol-4-Bk-5) Avail: NTIS HC A18/MF A01 CSCL 10B

The design, development and analysis of the 7.3 MW MOD-5A wind turbine generator is documented. There are four volumes. This volume contains the drawings and specifications that were developed in preparation for building the MOD-5A wind turbine generator. Detail drawings of several assemblies and sub-assemblies are given. This is the fifth book of volume 4. Author

N86-15731*# National Aeronautics and Space Administration, Washington, D.C.
MONOLITHIC CASCADE-TYPE SOLAR CELLS
S. Yamamoto, A. Shibukawa, and M. Yamaguchi Dec. 1985 12 p Transl. into ENGLISH of Japanese Patent no. 59-172780 (Appl. no. 1983-4718, 22 Mar. 1983) p 1-5 Transl. by The Corporate Word, Pittsburgh, Pa.
(Contract NASw-4006)
(NASA-TM-77926; NAS 1.15:77926) Avail: NTIS HC A02/MF A01 CSCL 10A

Solar cells consist of a semiconductor base, a bottom cell with a band-gap energy of E1, and a top cell with a band-gap energy of E2, and 0.96 < E1 > 1.36 eV and (0.80 E + 0.77) eV < E2 < (0.80 E1 + 0.92) eV. A monolithic cascade-type solar cell was prepared with an n(+)-type GaAs base, a GaInAs bottom solar cell, and a GaAlInAs top solar cell. The surface of the cell is coated with a SiO antireflection film. The efficiency of the cell is 32%. E.A.K.

N86-15732# Universal Energy Systems, Inc., Dayton, Ohio.
DLTS (DEEP-LEVEL TRANSIENT SPECTROSCOPY) ANALYSIS OF GERMANIUM AND Al SUB x Ga SUB 1-x As SOLAR CELLS Final Report, Mar. - Sep. 1984
S. S. Li Jul. 1985 68 p Prepared in cooperation with Florida Univ., Gainesville
(Contract F33615-81-C-2058)
(AD-A159114; AFWAL-TR-84-2093) Avail: NTIS HC A04/MF A01 CSCL 10/2

The objective of this research project is to investigate the radiation-induced deep-level defects in the one-MeV electron irradiated germanium and AlxGa1-xAs with x=0.05 and 0.17 using the Deep-Level Transient Spectroscopy (DLTS) and Capacitance Voltage (C-V) techniques. The I-V and C-V measurements were employed to estimate the background concentration in Ge irradiated by the one-MeV electrons for fluences of 1x10 to the 14th power, 1x10 to the 15th power, 1x10 to the 16th power per sq cm and in AlxGa1-xAs for fluences of 10 to the 15th power and 1x10 to the 16th power. The C-V and DLTS measurements were used to determine the defect parameters such as energy level, defect density and capture cross section of both electron and hole traps. This information is vital for designing a radiation hard cascade solar cell using materials such as germanium, GaAs and AlxGa1-xAs. Section 2 provides a brief overview of the radiation induced defects in germanium and AlGaAs as reported in the literature. In section 3 the results of the I-V, C-V and DLTS measurements on germanium samples are discussed. The physical origin of the radiation-induced defects are also depicted. Section VI described the DLTS and C-V results for the AlxGa1-xAs (with x = 0.05 and 0.17) specimen. Conclusions are given in the section V. GRA

N86-15733# Massachusetts Inst. of Tech., Cambridge. Lab for Water Resources and Hydrodynamics.
USER'S MANUAL FOR MASSACHUSETTS INSTITUTE OF TECHNOLOGY SOLAR THERMAL POND PROGRAM (MITSOL)
J. Atkinson, E. Adams, A. Salhotra, and R. Harleman Jun. 1985 116 p
(DE85-012147; SERI/STR-252-2879) Avail: NTIS HC A06/MF A01

The Massachusetts Institute of Technology Solar Pond Model (MITSOL) is a one-dimensional numerical model, written in FORTRAN, that may be used to predict transient vertical temperature and salinity profiles in a salt gradient solar pond. The formulation is based on a mixed-layer approach to modeling the vertical structure of a water body, and uses a finite difference explicit technique to solve basic salt and heat budget equations. A separate algorithm calculates wind-induced entrainment and subsequent deepening of the pond's upper mixed layer (or upper convecting zone). This report includes: (1) a discussion of the main program and subroutines and functions; (2) a discussion of the input file and the model's output; (3) a sample test case for the model; (4) the FORTRAN code for the model; and (5) a complete glossary for the code. DOE

N86-15734# Intersol Power Corp., Lakewood, Colo.
DEVELOPMENT AND FABRICATION OF PHOTOVOLTAIC CONCENTRATOR MODULES FOR A POINT-FOCUS FRESNEL LENS ARRAY
S. Broadbent and J. A. Sanders Jun. 1985 77 p
(Contract DE-AC04-76DP-00789)
(DE85-017322; SAND-85-7001) Avail: NTIS HC A05/MF A01

Design of the second generation photovoltaic concentrator module originally developed by Martin Marietta was improved. Module efficiency was improved from 14.4% to 15.5% and numerous detailed design enhancements were incorporated to facilitate fabrication and improve cost effectiveness. Sixty modules were manufactured to populate the second generation structure

already installed at the Sandia National Laboratories test site in Albuquerque, NM, plus 10 spares and test units. To further improve the life capability and facilitate installtion of the design, additional design development was authorized for: (1) cell interconnect research to provide greater stress relief at the cell-interconnect and substrate-interconnect interfaces; and (2) incorporation of a reflective secondary to relieve tracking accuracy and initial alignment accuracy requirements. DOE

N86-15735# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
165-kW OPEN-CYCLE OTEC EXPERIMENT
B. Shelpuk Jun. 1985 10 p Presented at the 20th Intersociety Energy Conversion Engineering Conference, Miami Beach, Fla., 18 Aug. 1985
(Contract DE-AC02-83CH-10093)
(DE85-008818; SERI/TP-251-2725; CONF-850808-14) Avail: NTIS HC A02/MF A01

The Solar Energy Research Institute (SERI) is developing a research experiment to establish the feasibility of producing significant amounts of net power from an open-cycle ocean thermal energy conversion (OC-OTEC) system. This experiment is sized at 165 kW sub e gross and is adequate to evaluate turbine performance and system process interactions at a scale that can be extrapolated to projected commercial market entry system sizes of 5 to 15 MW sub e. DOE

N86-15736# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
ANALYSIS OF A DIRECT RADIATION SOLAR DEHUMIDIFICATION SYSTEM
K. Schultz, R. Barlow, A. Pesaran, and F. Kreith 4 Aug. 1985 9 p Presented at the National Heat Transfer Conference, Denver, Colorado, 4 Aug. 1985
(DE85-008820; SERI/TP-252-2705; CONF-850810-22) Avail: NTIS MF A02/MF A01

SERI researchers investigated a desiccant dehumidifier that is regenerated by direct absorption of solar radiation using a simplified numerical model (DESSIM) of the adsorption and desorption processes. This paper presents estimates of the performance of a solar-fired air conditioning system (ventilation cycle) containing the dehumidifier/collector. The researchers also considered the effects of dehumidifier NTUs, heat exchanger performance, and insolation levels. The direct radiation system can operate effectively at low insolation levels and thus may have some advantages in some geographic areas. DOE

N86-15737# Los Alamos National Lab., N. Mex.
ASSESSMENT OF DYNAMIC ENERGY CONVERSION SYSTEMS FOR RADIOISOTOPE HEAT SOURCES
G. R. Thayer and C. A. Mangeng Jun. 1985 137 p
(Contract W-7405-eng-36)
(DE85-016202; LA-10462-MS) Avail: NTIS HC A07/MF A01

The use of dynamic conversion systems to convert the heat generated in a 7500 W(t) 90 Sr radioisotopic heat source to electricity is examined. The systems studies were: Stirling; Brayton cycle; three organic Rankines (ORCs) (Barber-Nichols/ORMAT, Sundstrand, and TRW); and an organic Rankine plus thermoelectrics. The systems were ranked for a North Warning System mission using a Los Alamos multiattribute decision theory code. Three different heat source designs were used: case 1 with a beginning of life (BOL) source temperature of 640 C, case 2 with a BOL source temperature of 745 C, and case 3 with a BOL source temperature of 945 C. The Stirling engine system was the top-ranked system of case 1 and 2, closely followed by the ORC systems in case 1 and ORC plus thermoelectrics in case 2. The Brayton cycle system was top-ranked for case 3, with the Stirling engine system a close second. The use of (238) Pu in heat source sizes of 7500 W(t) is examined and it is found to be questionable because of cost and material availability and because of additional requirements for anlaysis of safeguards and critical mass. DOE

N86-15738# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SYSTEM ENGINEERING AND ENERGY COST ANALYSIS OF SMALL AND MEDIUM WIND TURBINES
P. K. C. Tu Jul. 1985 17 p Presented at the International Conference on Solar and Wind Energy Applications (ICSWEA), Beijing, China, 3 Aug. 1985
(DE-AC02-83CH-10093)
(DE85-012159; SERI/TP-217-2785; CONF-850888-2) Avail: NTIS HC A02/MF A01

A preliminary system-level, computational model was developed to allow broad assessment and optimization of wind turbine design and costs analysis at The Wind Energy Research Center, Solar Energy Research Institute under contract to the US Department of Energy (DOE). This paper briefly describes the basic principles used in the model for energy capture and cost-of-energy (COE), and demonstrates the model's usefulness in determining the effects of rotor and system design modifications. The model's utilization for conducting parametric studies and defining the energy cost of small and medium-sized wind turbines is also shown. Topics of interest to wind turbine engineers and designers include the effects on rotor performance of airfoil geometry, blade pitch angle setting, and the system RPM schedule, etc. DOE

N86-15739# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Gruppe Solarenergiewandlung.
MEASUREMENT OF RADIATION INTENSITY ON THE IEA SSPS/CRS SOLAR TOWER PLANT IN SPAIN
Andreas Brinner Jun. 1985 43 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-961)
(DFVLR-FB-85-36; ISSN-0171-1342) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 15

The Kendall MK 9 radiometer was selected to measure the radiation intensity on the IEA SSPS/CRS solar tower plant in Spain. The measuring signal was applied to calibrate a video camera used for measurement of power density distribution in the aperture of the solar absorber. The measurement results were used to show a relationship between the gray values of a video picture of the ASR receiver under radiation and the absolute radiation intensity measured at three points so as to calculate the absolute irradiation in MW. The tests show good reproducibility and high accuracy. The conversion factors were applied to calculate the flux distribution, the maximal flux, and the ASR receiver efficiency.
Author (ESA)

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N86-15740# Dugway Proving Ground, Utah.
MIGRATION OF HAZARDOUS SUBSTANCES THROUGH SOIL. PART 2: DETERMINATION OF THE LEACHABILITY OF METALS FROM FIVE INDUSTRIAL WASTES AND THEIR MOVEMENT WITHIN SOIL Final Report, Apr. 1974 - Dec. 1977
M. J. Houle, D. E. Long, R. Bell, D. C. Weatherhead, Jr., and R. Grabbe Aug. 1985 284 p
(AD-A158990; DPG-FR-85-012) Avail: NTIS HC A13/MF A01 CSCL 13/2

Samples of industrial wastes from the electroplating, inorganic pigment, nickel-cadmium battery, water-base paint, and chlorine production industries were characterized as to their composition, toxic metal content, and leaching characteristics using serial batch extractions and continuous flow columns. Distilled water was used as one solvent to simulate rainwater or ground water and municipal landfill leachate was used to simulate the effects of mixing industrial and municipal refuse in the same disposal site. The metal content of the waste leachate was measured before and after contact with the soil. The soils used were: Davidson, Chalmers,

Nicholson, Anthony, and Kalkaska. The metals of interest were: cadmium, chromium, copper, mercury, lead, nickel, and zinc. The concentration of metals in waste and soil leachate were compared to published drinking water standards. It was found that the nickel-cadmium battery waste was extremely soluble and both water and municipal landfill leachate released extremely high concentrations of nickel and cadmium. These metals rapidly penetrated soil columns and would overwhelm the attenuation capacity of the soils underlying a disposal site. GRA

N86-15741# Department of Energy, New York. Environmental Measurements Lab.
WORLDWIDE DEPOSITION OF (90)Sr THROUGH 1983
R. J. Larsen Jul. 1985 160 p refs
(DE85-017599; EML-444) Avail: NTIS HC A08/MF A01

The total deposition of Sr 90 in the Northern Hemisphere during 1983 was 0.3 PBq, while the total deposition in the Southern Hemisphere was 0.2 PBq making the total deposition on the surface of the Earth during 1983 0.5 PBq. This is the lowest total yearly deposit since the initiation of the Environmental Measurements Laboratory's global fallout program in the late 1950's. The worldwide cumulative deposit decreased to 365.6 PBq. The last reported nuclear detonation in the atmosphere occurred at the Lop Nor test site in China on October 16, 1980. DOE

N86-15742# Argonne National Lab., Ill.
CONTROLLING ACIDIC DEPOSITION: TARGETED STRATEGIES FOR REDUCING SULFUR DIOXIDE EMISSIONS
D. G. Streets, D. A. Hanson, L. A. Conley, and L. D. Carter Oct. 1984 80 p
(Contract W-31-109-eng-38)
(DE85-015058; ANA/EES-TM-282) Avail: NTIS HC A05/MF A01

This volume presents methods of optimizing the efficiency of selected control proposals presented in the 98th Congress. These methods apply models of sulfur dioxide emissions and control costs and models of atmospheric transport and deposition of sulfur. In particular, targeted strategies that aim to reduce deposition in several sensitive regions at minimum cost are described. The cost-effectiveness of proposed and targeted strategies is compared. DOE

N86-15743# Brookhaven National Lab., Upton, N. Y.
CAPABILITIES, NEEDS AND APPLICATIONS OF GASEOUS TRACERS
R. N. Dietz and G. I. Senum Aug. 1984 65 p Workshop held on Atmospheric Tracers, Santa Fe, New Mexico, 21 May 1984
(DE85-015194; BNL-35108; CONF-8405224-3) Avail: NTIS HC A04/MF A01

Those compounds which meet most or all of the gaseous conservative tracer criteria for selection, including low atmospheric background concentration, simple sample workup and analysis, high detectability, limited industrial use, harmless, low reactivity and removal rates, and low cost generally are confined to SF6, halocarbons, perfluorocarbons, and deuterated methanes. The properties, availability, and cost of these tracers are reviewed. A system for tagging and following a parcel of air consists not only of the gaseous tracer, but also its release, sampling, and analysis equipment; each will be reviewed in some detail. For tracers that are gases at normal temperatures the release is simply through metered valves; for those that are liquids, metered atomization and/or vaporization techniques must be used. Sampling has most commonly been performed by whole air techniques (plastic bags, syringes, evacuated bottles, etc.) but also by adsorbent samplers, located primarily on the ground but in a number of cases above-ground as well with the use of vertical sampling techniques. Analyses for some tracers can be done in real-time making use of aircraft more viable. The techniques for analyzing collected air samples are discussed. DOE

N86-15744# Argonne National Lab., Ill.
PROPOSALS FOR ACID-RAIN CONTROL FROM THE 98TH CONGRESS
D. G. Streets, J. E. Vernet, and T. D. Veselka Oct. 1984 111 p (Contract W-31-109-eng-38)
(DE85-015268; ANL/EES-TM-281) Avail: NTIS HC A06/MF A01

This volume summarizes the acid-rain-control activities of the 98th Congress, collating and analyzing many of the major bills in the form in which they were proposed. Effects of the proposals are compared, with emphasis on control costs, sulfur dioxide emission reductions, and coal usage. DOE

N86-15745# Institute of Oceanographic Sciences, Wormley (England).
A REVIEW OF BIOLOGICAL PROCESSES WITHIN OCEANIC WATER COLUMNS RELEVANT TO THE ASSESSMENT OF THE SAFETY OF DISPOSAL OF WASTE, NOTABLY RADIOACTIVE ISOTOPES, ON OR WITHIN THE SEABED
M. V. Angel 1985 96 p refs
(Contract DOE-DGR-481/178)
(IOS-198; DOE/RW-84/163) Avail: NTIS HC A05/MF A01

Pelagic biological processes and their connotations in the assessment of dispersal mechanisms of contaminants released on the deep oceanic seabed are reviewed. Biological gradients tend to be from the surface down so the search is for processes which run counter to these general gradients. Observed profiles off standing crop of plankton and micronekton show that below 2000 m biological activity has to be exceptionally dynamic to have an influence even within an order of magnitude of the dispersive effect of physical mixing. Examination of all forms of known migration mechanisms fails to reveal such dynamic activity. No critical pathways within the present or foreseeable pattern of exploitation of the oceans are identified. However, a major gap in knowledge is whether the pattern of these biological processes changes substantially in the region of continental slopes.
Author (ESA)

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N86-15746 Washington Univ., Seattle.
GEOLOGY, PETROLOGY, AND GEOCHEMISTRY OF A YOUNGER GRANITE PLUTON, CENTRAL EASTERN DESERT OF EGYPT; IMPORTANCE OF MIXING Ph.D. Thesis
Mohamed Ibrahim Sultan 1984 248 p
Avail: Univ. Microfilms Order No. DA8509055

The Younger Granite pluton that is the main subject of study of this work, is a small epizonal pluton in the central part of the Eastern Desert (C.E.D.) of Egypt. This pluton is a representative example of widespread and abundant shallow intrusions emplaced in northern and northeastern Africa in late Precambrian time. The Younger Granite pluton occupies a central position in the Maetiq Dome, a metamorphic core complex. It was emplaced along foliation planes of the country rocks, mainly gneisses and mylonites. This together with other observations indicate that it is a sill. Samples from the Younger Granite pluton are silica rich (77.2-75.3 wt% SiO_2), metaluminous to peraluminous rocks (molar $Al_2O_3/(Na_2O + K_2O + CaO) = 0.98 - 1.09$). Whole rock major element abundances of 21 samples show only small variation in SiO_2, Al_2O_3, Na_2O and K_2O compared to larger variation for the less abundant major elements such as FeO, TiO_2, CaO, MnO and MgO and the trace elements Sc, Cr, Co, Rb, Sr, Zr, La, Ce, Nd, Sm, Tb, Yb, Lu, Ta, Th and U. Dissert. Abstr.

N86-15747 California Univ., Santa Barbara.
PALEOMAGNETISM AND TECTONICS OF THE CENTRAL AND EASTERN TRANSVERSE RANGES, SOUTHERN CALIFORNIA Ph.D. Thesis
Richard Ralph Terres 1984 364 p
Avail: Univ. Microfilms Order No. DA8509456

This paleomagnetic study was conducted with the purpose of characterizing the extent, timing, and magnitude of tectonic rotations in the eastern parts of the Transverse Ranges in an effort to understand better the Neogene tectonic evolution of Southern California. Paleomagnetic studies were conducted on the following rock units; the mid- Tertiary Plush Ranch, Vasquez, and Diligencia formations; the upper Miocene Mint Canyon Formation; and Mesozoic mafic and felsic dike rocks and Miocene basalt flows of the Eagle and Chuckwalla Mountains. In total, 1167 oriented samples from 185 sites were collected and analyzed. Clockwise tectonic rotations, as indicated by anomalous paleomagnetic declinations are inferred for the Diligencia Formation (90 deg to 220 deg), the Vasquez Formation (up to 90 deg), and the Eagle Mountains (40 deg). The mean results of the Plush Ranch and Mint Canyon formations are not anomalous. In the Diligencia Formation, dextral shearing adjacent to the right-slip Clemens Well fault caused localized clockwise rotations of perhaps over 100 deg. Dissert. Abstr.

N86-15748 Texas A&M Univ., College Station.
ONE-DIMENSIONAL ITERATIVE INVERSION OF VERTICAL SEISMIC PROFILES Ph.D. Thesis
William Gregory Dillon 1985 178 p
Avail: Univ. Microfilms Order No. DA8514247

In a vertical seismic profile, the earth's response to a surface excitation is measured by geophones located in a borehole. The objective of this research has been to use the recorded up and downgoing waves to estimate depths to reflectors and velocities below the bottom of the well and in the near surface. An inversion scheme was developed to accomplish this. It works by iteratively adjusting a forward model unit its output best matches a recorded field trace (in a least squares sense). The forward model is the well known equal-traveltime model. The model consists of reflecting interfaces spaced at uniform traveltime intervals. The output of the model is adjusted by using a steepest descent technique to change the reflection coefficients characterizing the interfaces. By assuming constant density and by knowing the velocity in one layer, the reflection coefficients derived from the scheme may be converted into velocity and depth estimates. Dissert. Abstr.

N86-15749 Rice Univ., Houston, Tex.
RADIATION PRESSURE AND THE GEOCORONA Ph.D. Thesis
James Edward Bishop 1985 139 p
Avail: Univ. Microfilms Order No. DA8517178

The theory of planetary exospheres is extended to incorporate solar radiation pressure in a rigorous manner, and an evaporative geocoronal prototype (classical, motionless exobase) is constructed using Liouville's theorem. Calculations for density and kinetic temperature at points along the Earth-Sun axis (solar and anti-solar directions) reveal an extensive satellite component, comprising approx. 2/3 of the total hydrogen density near 10 Earth radii, and a temperature profile suggestive of a near-isotropic quasi-Maxwellian kinetic distribution for the bound component. A geotail is also evident in this model as an enhancement of the local midnight density compared to local noon that increases radially outward from roughly 25% at 10 Earth radii to over 60% at 20 Earth radii. Additional mechanisms acting upon the geocorona alter this evaporative case in notable ways. Solar ionization has been include in a simple fashion; the effect is to deplete the density somewhat without otherwise altering the structure. Dissert. Abstr.

N86-15750 California Univ., San Diego.
SEISMIC MOMENT TENSOR RECOVERY AT LOW FREQUENCIES Ph.D. Thesis
Mark Alan Riedesel 1985 280 p
Avail: Univ. Microfilms Order No. DA8515601

A low-frequency, normal mode technique which provides estimates of the seismic moment tensor in as many as ten separate 1 mHz bands is described. The basic data kernels are integrals of the complex spectra of the untaped seismograms with a bandwidth of .1 mHz, centered on the model frequencies of the fundamental modes. The frequency-domain integration process reduces the sensitivity of the solutions to attenuation and splitting. Adjustments in the phase of the integrals are computed to compensate for the effects of latteral heterogeneity, station timing errors, and centroid time shifts. Estimates of the covariance of the solutions are used to provide uncertainties for the source mechanism and the principle stress axes. A graphical method is developed which allows a rapid visual assessment of the significance of nondouble-couple and isotropic components of the solutions. The method was applied to 57 earthquakes recorded on the IDA network between 1977 and 1984. The moment rate tensor and its uncertainty was investigated in 1 mHz bands over the 1 to 11 mHz frequency range. Dissert. Abstr.

N86-15751 Florida Univ., Gainesville.
THE EFFECT OF THE BENTHIC BOUNDARY LAYER ON THE PHYSICS OF INTENSE MESOSCALE EDDIES Ph.D. Thesis
Germana Peggion 1985 152 p Previously announced as N85-28270
Avail: Univ. Microfilms Order No. DA8517345

It is found that the decay of eddy-like flow occurs through conversion of kinetic to potential energy and through dissipation by bottom friction. The relative importance of both processes is expressed by the Rossby number and by the stratification parameter. A larger Rossy number and stratification parameter lead to a larger conversion of kinetic to potential energy, but a smaller mechanical dissipation of the same energy. Examination of the structure of the Benthic Boundary Layer indicates that a clear distinction should be made between the mixed layer, or the region neutrally stratified, and the Bottom Boundary Layer, or the region where most of the turbulent activity occurs. It is found that the structure of the Bottom Boundary Layer depends also on the magnitude of the flow above the Benthic region, but the mixed layer depends also on the sign of the mesoscale activity. Under a cyclonic flow, the mixed layer is defined by vertical advection and it is usually much thicker than the Bottom Boundary Layer. The mixed layer of an anticyclonic flow is the result of both vertical advection and near bottom turbulence, and the ambiguity between the mixed layer and Bottom Boundary Layer is notably reduced. GRA

N86-15752 Rhode Island Univ., Kingston.
STRUCTURE AND TECTONICS OF THE LONG ISLAND PLATFORM Ph.D. Thesis
Deborah Ruth Hutchinson 1985 306 p
Avail: Univ. Microfilms Order No. DA8516674

Structures within the crust of the Long Island platform have been mapped using multichannel seismic-reflection profiles and magnetic and gravity data. Four buried rift basins show that low-angle normal faults, high-angle cross faults and possibly regional uplift characterized the platform during active rifting in the early Mesozoic. Crustal thinning probably occurred along both low-angle normal faults (three basins) and detachment surfaces (one basin). Reactivated Paleozoic structures have controlled the general shape and orientation of these basins, except possibly near the basement hinge zone. A low-angle, west dipping fault, the Block Island fault, penetrates most of the crust and is characterized by a large north-trending magnetic high at its basement subcrop. The fault is interpreted to be equivalent to the late Paleozoic boundary between the Avalon block and North America and provides evidence that crustal imbrication, as well as thin-skinned tectonics, from the Appalachian orogen. This low-angle fault may have been reactivated in Cretaceous and Tertiary times to form the near-vertical postrift New Shoreham fault as an antithetic (i.e., normal) or splay (i.e., reverse) fault off the deeper structure. Dissert. Abstr.

N86-15753 Institut d'Aeronomie Spatiale de Belgique, Brussels.
THE CO2 AND CO ABUNDANCES BELOW 130 km ALTITUDE FROM INFRARED SPECTRA
J. Vercheval, C. Lippens, C. Muller, M. Ackerman, M.-P. Lemaitre (ONERA, Paris, France), J. Besson (ONERA, Paris, France), A. Girard (ONERA, Paris, France), and J. Laurent (ONERA, Paris, France) 1985 19 p refs Presented at American Geophysics Union Fall Meeting, 3-7 Dec. 1984

(Aeronomica-Acta-A-296-1985) Avail: Issuing Activity
Observations of infrared absorption lines by grill spectrometer on Spacelab 1 are used to determine CO2 and CO abundances in the low thermosphere and in the middle atmosphere. It is shown that the results can be well represented by theoretical models based on the interaction processes between solar UV radiation, CO, CO2 and OH molecules. Author (ESA)

N86-15754# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE TWILIGHT SODIUM LAYER
V. W. J. H. Kirchhoff, P. P. Batista, B. R. Clemesha, and D. M. Simoich Jul. 1985 19 p refs Presented at the 5th Scientific Assembly IAGA, Symposium on Metallic Atoms and Ions, Prague, 13 August 1985 Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico
(INPE-3568-PRE/773) Avail: NTIS HC A02/MF A01

It is believed that the sodium photochemistry is strongly influenced by mesospheric atomic oxygen and ozone and one might thus expect sodium variations to occur during twilight. This expectation has been investigated by measuring the sodium density using a laser radar system. The results are reported for thirty-one evening twilights and compare with the recent model calculations. The measurements show a rapid decrease in sodium density at the bottom of the layer, immediately after sunset, in agreement with the theoretical predictions. B.W.

N86-15755*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AURORAL THERMOSPHERE TEMPERATURES FROM OBSERVATIONS OF 6300 A EMISSIONS
John C. Bird (Alabama Univ., Huntsville), Gary R. Swenson, and Richard H. Comfort (Alabama Univ., Huntsville) Nov. 1985 65 p refs
(NASA-TM-86530; NAS 1.15:86530) Avail: NTIS HC A04/MF A01 CSCL 04A

Doppler temperatures determined from observations of the atomic oxygen OI 6300 A line during March 1984 at the University of Alaska/Fairbanks are presented. Temperatures are obtained from Fabry-Perot Interferometer pressure scans using a Fourier transform smoothing and fitting technique; this technique is presented in detail. The temperatures and the spread in the temperatures are consistent from day to day. On the clear nights of March 10 to 13, the temperatures were 800, 750, 750 and 800 K, respectively, with a spread of + or - 100 K. These temperatures are compared to the MSIS (84) model atmosphere for similar geomagnetic conditions and found to be in general agreement; they are also consistent with results obtained by other investigators. Author

N86-15756*# ST/E Technical Services, Inc., San Ramon, Calif.
MICRO-RAMAN SPECTROSCOPY: THE ANALYSIS OF MICROMETER AND SUBMICROMETER ATMOSPHERIC AEROSOLS Final Technical Report
Stan M. Klainer and Fred P. Milanovich 20 Jun. 1985 59 p refs (Contract NAS1-17943)
(NASA-CR-177964; NAS 1.26:177964) Avail: NTIS HC A04/MF A01 CSCL 04A

A nondestructive method of molecular analysis which is required to fully utilize the information contained within a collected particle is discussed. Upper atmosphere reaction mechanisms are assessed when the chemical compounds, the use of micro-Raman spectrometric techniques to perform micron and submicron particle analysis was evaluated. The results are favorable and it is concluded that micron and submicron particles can be analyzed by the micron-Raman approach. Completely automatic analysis should be possible to 0.3 micro m. No problems are anticipated with photo or thermal decomposition. Sample and impurity fluorescence are the key source of background as they cannot be completely eliminated. Author

N86-15757# Aerospace Corp., El Segundo, Calif.
THE CHARGE-STATE COMPOSITION OF 0.4-MeV HELIUM IONS IN EARTH'S OUTER RADIATION BELTS DURING QUIET TIMES
David L. Chenette, J. Bernard Blake, and Joseph F. Fennell 30 Sep. 1984 30 p refs
(Contract F04701-83-C-0084)
(AD-A147561; TR-0084(4940-05)-06; SD-TR-84-48) Avail: NTIS HC A03/MF A01 CSCL 04/1

The charge state of 0.40 to 0.55 MeV helilum ions in Earth's outer magnetosphere (L approx. 6) were measured by a novel technique. The radial gradient of the helium ion flux and the east-west anisotropy in the pitch-angle distribution are both measured. These are combined with measurements of the magnetic field to calculate the flux-weighted average ion gyroradius. Since the magnitude of the magnetic field and the energies of the ions are known, the gyroradius determines the ion's charge state. During two pairs of geomagnetically quiet days in 1979 it was found that most of these ions are singly charged which is in accord with theoretical calculations which found that charge-exchange reactions between these ions and the neutral hydrogen geocorona are the dominant factors in controlling the charge state of these ions at times longer than a day after their injection. It is also suggested that the mean charge state of the helium ions may vary with position in the magnetosphere and with time. E.A.K.

N86-15758# Messina Univ. (Italy). Ist. di Struttura della Materia.
THE OPTICAL SPECTRA OF AEROSOLS Final Technical Report
F. Borghese Feb. 1985 109 p
(Contract DAJA37-81-C-0895)
(AD-A158057; R/D-4103-EN) Avail: NTIS HC A06/MF A01 CSCL 04/1

The macroscopic optical constants of an aerosol of model nonspherical particles are calculated. The effect of chemical reactions on the spectra of the aerosols are taken into account. The computer programs necessary to perform these calculations are listed and a user's guide is supplied. GRA

N86-15759# Herndon Science and Software, Inc., San Diego, Calif.
TECHNOLOGICAL APPLICATIONS OF EARTH CORE RESEARCH Final Report, 1 Jan. 1982 - 1 Jan. 1985
J. M. Herndon May 1985 37 p
(Contract F49620-82-C-0024)
(AD-A158991; HSSI-82-0004; AFOSR-85-0728TR) Avail: NTIS HC A03/MF A01 CSCL 08/4

The research undertaken under the present AFOSR contract is intended to address the question of what elements might be expected to form silicides in the core of the Earth and is aimed at determining and demonstrating the technological feasibility of new concepts originating from the research. Specifically, the research objectives are the following: (1) prepare a complete bibliography on silicide technology, including the physical and chemical properties; (2) determine the effects of phosphorous and copper on nickel silicide, conduct experiments to determine what elements form silicides; (3) conduct experiments on Earth core type materials to provide new materials and processes. The schedule is given for the tasks that are the research objectives and the deliverables. GRA

N86-15760# Naval Research Lab., Washington, D. C.
TRANSVERSE MOTION OF HIGH SPEED BARIUM CLOUDS IN THE IONOSPHERE
H. G. Mitchell, J. A. Fedder, J. D. Huba, and S. T. Zalesak 18 Sep. 1985 19 p
(AD-A159058; NRL-MR-5626) Avail: NTIS HC A02/MF A01 CSCL 04/1

Simulation results, based on a field-line-integrated, 2D, electrostatic model, are presented for the motion of a barium cloud injected transverse to the geomagnetic field in the ionosphere at high speeds. It is found that the gross evolution of injected plasma clouds depends sensitively on the initial conditions, as well as the nature of the background coupling. For a massive (M sub O =

approx. 10 kg), orbital (V sub O = approx. 5 km/sec) release in the F region (350 to 450 km), we find that plasma clouds can drift tens of kilometers across the magnetic field in tens of seconds after ionization. GRA

N86-15761# Royal Norwegian Council for Scientific and Industrial Research, Kjeller.

DEVELOPMENT AND EVALUATION OF A REGIONAL SEISMIC ARRAY IN NORWAY Quarterly Technical Report, 1 Jan. - 31 Mar. 1985

S. Mykkeltveit, ed. 30 Apr. 1985 38 p

(Contract F49620-85-C-0016; AF Proj. 2309; ARPA Order 2309) (AD-A159129; AFOSR-85-0717TR) Avail: NTIS HC A03/MF A01 CSCL 08/11

Field installations have been operating very reliably during the reporting period. Sources of rather minor errors in the data were traced in close cooperation with Sandia, and appropriate actions were taken to modify the field system to eliminate these errors. Computer equipment for acquisition and processing of the NORESS data has been purchased and installed. All data received at Kjeller are now subjected to online processing for detection and location of seismic events. The RONAP program package, developed at NORSAR during the last couple of years, has been adapted for use on the new data. An advanced status monitoring system has been developed. This system generates statistics on all essential aspects of operations of the new array and suitable units for display of essential parameters have been acquired and installed. Author (GRA)

N86-15762# Sandia National Labs., Albuquerque, N. Mex. Waste Management Systems Div.

DETERMINING PROBABILITIES OF GEOLOGIC EVENTS AND PROCESSES

R. L. Hunter, C. John Mann (Illinois Univ., Urbana), and R. M. Cranwell 1985 10 p Presented at conference

(Contract DE-AC04-76DP-00789)

(TI85-014642; SAND-85-0024C; CONF-850918-3) Avail: NTIS HC A02/MF A01

The Environmental Protection Agency has recently published a probabilstic standard for releases of high-level radioactive waste from a mined geologic repository. The standard sets limits for contaminant releases with more than one change in 100 of occurring within 10,000 years, and less strict limits for releases of lower probability. The standard offers no methods for determining probabilities of geologic events and processes, and no consensus exists in the waste-management community on how to do this. Sandia National Laboratories is developing a general method for determining probabilities of a given set of geologic events and processes. In addition, we will develop a repeatable method for dealing with events and processes whose probability cannot be determined. Author

N86-15763# Comision Nacional de Investigacion del Espacio, Madrid.

MEASUREMENTS OF STRATOSPHERIC OZONE BY INDIGO DECOLORATION

J. M. Cisneros 1985 5 p refs

Avail: NTIS HC A02/MF A01

A simple system for ozone stratospheric measurements to be used with big balloons was designed. Good measurements are obtained in flight tests. Maximum relative error is 20%. Author (ESA)

N86-15764# Uppsala Ionospheric Observatory (Sweden).

LOWER HYBRID PARAMETRIC PROCESSES ON AURORAL FIELD LINES IN THE TOPSIDE IONOSPHERE

Hannu E. J. Koskinen 23 Apr. 1985 42 p refs

(UIO-SR-85-03; ISSN-0349-2699) Avail: NTIS HC A03/MF A01

Parametric decay channels of lower hybrid waves (LHW) in a topside ionospheric plasma are considered in order to find out whether VLF waves generated by precipitating keV electrons could be converted into waves having larger perpendicular wave number and thus interacting more effectively with ionospheric ions. In dipole approximation, it is found that the most promising decay channel is a decay into an LHW and a nonresonant quasi-mode. However, use of the dipole approximation can be criticized and a consideration of the wave vector of the pump suggests that the decay into hot ion plasma waves or ion Bernstein waves and nonresonant quasi-modes is important. The theory of parametric processes could be applied in interpretation of sounding rocket data where artificially produced LHW's are detected together with other wave modes. Author (ESA)

N86-15765# Research Inst. of National Defence, Stockholm (Sweden). Dept. 2.

THE SEISMICITY OF SOUTHERN SWEDEN, 1979 - 1984 Final Report

Ragnar Slunga Apr. 1985 47 p refs Sponsored by Swedish Nuclear Power Inspectorate and Swedish National Board for Spent Fuel

(FOA-C-20572-Ti; ISSN-0347-3694) Avail: NTIS HC A03/MF A01

The focal depths of Swedish seismic activity and their relation to knowledge about stick-slip motion of granites for varying pressures and temperature are shown. Agreement is very good with most seismic activity in the range 7 to 18 km. One earthquake is found to have a most likely focal depth just below the Moho discontinuity while no earthquake is observed in the lowest 10 km of crust. The apparent crustal thickness of southern Sweden was studied by regional network recordings. The results are given as an apparent crustal thickness map. The crustal thickness seems to vary between 32 and 48 km and indicates a possible block structure with block sizes of the order of 50 to 150 km. Author (ESA)

N86-15766# Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau (West Germany).

PROJECT HERO: HEATING ROCKET EXPERIMENTS. THE H AND E FIELD PROBE (HESO): IN SITU MEASUREMENTS OF PLASMA PARAMETERS IN THE IONOSPHERIC PLASMA MODIFIED BY ELECTROMAGNETIC WAVES OF HIGH INTENSITY Final Report, Dec. 1984

Gerhard Rose Bonn Bundesministerium fuer Forschung und Technologie Aug. 1985 81 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-W-85-009; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17

In situ artificial ionospheric modifications produced in the undisturbed F-layer by high power radio waves were measured. Electron density fluctuations and their variations along the trajectory, and the spectra of the generated electrostatic high frequency electron plasma waves and of the low frequency ion acoustic waves were observed. Their effects on the plasma, increased electron temperature, appearance of suprathermal electrons and of plasma inhomogeneities were observed. Local electric and magnetic fields of the heating wave were recorded. The preparation and calibration of the H and E field probes, and the HESO experiments and their functions in plasma are described. Author (ESA)

N86-15701# Hokkaido Univ., Sapporo (Japan). Dept. of Geophysics.

A STUDY OF THE STRONG GROUND MOTION OF THE WESTERN HIDAKA, HOKKAIDO EARTHQUAKE

Tsutomu Sasatani *In its* Geophysical Bulletin of Hokkaido Univ., No. 46 Oct. 1985 p 69-83 refs In JAPANESE; ENGLISH summary (For primary document see N86-15695 06-42)

Avail: NTIS HC A05/MF A01

N86-15702# Hokkaido Univ., Sapporo (Japan). Research Center for Earthquake Prediction.

SEISMIC INTENSITY SURVEY AND HYPOCENTER RECALCULATION ON THE 1985 SAPPORO EARTHQUAKE (M 3.5)

Sadaomi Suzuki and Yoshinobu Motoya *In its* Geophysical Bulletin

of Hokkaido Univ., No. 46 Oct. 1985 p 85-91 refs In JAPANESE; ENGLISH summary (For primary document see N86-15695 06-42)
Avail: NTIS HC A05/MF A01

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N86-15767 Meteorological Office, Bracknell (England).
TEMPERATURE AND HUMIDITY DATA FOR DESIGN: BRITISH FORCES AREA OF WEST GERMANY
M. E. Crewe Nov. 1984 24 p refs
(Met-O-Memo-113; Met-O-9; ISBN-0-86180-184-9; BR95133)
Copyright. HC A02/MF A01

The air temperature regime of the No. 1 (BR) Corps area of West Germany is described using graphs derived from computer analyses of observations made at Gutersloh and Hannover. Cumulative frequency distributions from which temperatures corresponding to any percentage probability can be read off, and used for design standards limits are emphasized. Diurnal cycles for testing material are considered. Frequencies of dew-point and relative humidity at given temperatures are depicted. Temperatures in the area are related to those in other parts of western Europe.
Author (ESA)

N86-15768# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
LARGE-SCALE CIRCULATION ANOMALIES AND THE PREDICTABILITY OF NORTHEAST BRAZIL DROUGHTS
Paulo Nobre, Carlos A. Nobre, and Antonio D. Moura Sep. 1985 47 p refs Submitted for publication
(INPE-3656-PRE/819) Avail: NTIS HC A03/MF A01

An analysis of the monthly departure of the relative vorticity and wind fields over the globe was performed for the period from 1963 to 1980. Planetary-scale wavelike (teleconnection) patterns were observed in the vorticity and wind deviation fields extending from subtropical North Atlantic through the North Pole to eastern Siberia for years of droughts and excessive rainfall over Northeast Brazil (Nordeste). These patterns are sharpest in December and January. Of major interest is the phase coherence of the wavelike patterns and the precipitation anomalies of Nordeste, that is, the phase of the patterns is reversed from very dray to very wet years. Such phase coherence and also the emergence and persistence of the wavelike pattern several months preceding the rainy season in Nordeste (March and May), seems to indicate that there might be some predictive potential in these configurations. An index of the existence and phase of the wavelike patterns was developed. It was seen that the sign of the index is highly associated with the sign of the precipitation anomaly in Nordeste for most of the years.
Author

N86-15769*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
NASA/MSFC FY-85 ATMOSPHERIC PROCESSES RESEARCH REVIEW
William W. Vaughan, comp. and Fay Porter, comp. Washington Oct. 1985 143 p refs Review held in Huntsville, Ala., 7-9 May 1985 and in Columbia, Md., 8-12 Jul. 1985
(NASA-CP-2402; M-503; NAS 1.55:2402) Avail: NTIS HC A07/MF A01 CSCL 04B

The two main areas of focus for NASA/MSFC's Atmospheric Research Program are: (1) Global Scale Processes (Geophysical Fluid Processes, Satellite Doppler Lidar Wind Profiler, and Satellite Data Analyses); and (2) Mesoscale Processes (Atmospheric Electricity (Lightning), Ground/Airborne Doppler Lidar Wind Measurements, and Mesoscale Analyses and Space Sensors). The research project summaries, in narrative outline, supplied by the individual investigators are presented. For individual titles, see N86-15770 through N86-15820.

N86-15770*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THEORETICAL AND EXPERIMENTAL STUDIES OF BAROCLINIC PROCESSES
Tim L. Miller, Fred Leslie, Dan R. Fitzjarrald, and Nathaniel Reynolds *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 5-6 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

An experimental study in a baroclinic annulus with heating and cooling on the upper and lower horizontal surfaces was completed. Four basic regimes of flow were observed: (1) axisymmetric flow, (2) cellular (deep) convection, (3) convective rolls (boundary layer), and (4) baroclinic instability. There was no symmetric (or nearly symmetric) baroclinic instability observed, although it was determined by numerical calculations that regions in parameter space were transversed where the symmetric instability was present. The nonsymmetric baroclinic instability (Eady type) was observed instead. A linear analysis of symmetric baroclinic instability was completed. The analysis covered the range from nonhydrostatic through strongly hydrostatic (i.e., from weakly baroclinic through strongly baroclinic) cases. The dependence of the critical Richardson number (Ri) upon baroclinicity, Ekman number, and Prandtl number was ellucidated. A linear analysis of three dimensional, nongeostrophic baroclinic instability was completed. It was shown that, when finite viscosity is present, the preferred angle of orientation (for small enough Ri) is not the symmetric angle, regardless of Prandtl number.
Author

N86-15771*# Mississippi Univ., University.
MOBILE INTERCEPT OF STORMS
Roy T. Arnold *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 7-8 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

A NASA U2 research aircraft was used to fly over storms in the area of Oklahoma, southern Kansas, and north Texas. The primary goal was to acquire lightning data to serve as ground truth for U2 overflights. A mobile laboratory was instrumented and the storm intercept was coordinated through communication to the U2 provided by airplane guidance at NSSL and through direct communication with the U2 pilot from a portable transceiver in the mobile lab. The flights were successful in spite of an unusual sparsity of storm activity during the operational period and an early termination of the scheduled flight program. Severe storms data was gathered within the area of Oklahoma with good Doppler radar coverage. A vehicle followed a mobile lab and released instrumented balloons. A standard meteorological rawinsonde was used as was a balloon-borne electric field meter. There was success in flying, tracking, and receiving data from mobily launched balloons on several days.
Author

N86-15772*# Colorado Univ., Boulder. Dept. of Astrophysical, Planetary and Atmospheric Sciences.
THEORETICAL AND EXPERIMENTAL STUDIES IN SUPPORT OF THE GEOPHYSICAL FLUID FLOW EXPERIMENT
John Hart and Juri Toomre *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 9-11 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

The continuous low gravity environment of the orbiting space shuttle offers an opportunity to make laboratory studies of such large scale thermally driven flows under the constraint imposed by rotation and sphericity. This is possible because polarization forces in a dielectric liquid, which are linearly dependent on fluid temperature, give rise to an effectively radial buoyancy force when a radial electrostatic field is imposed. The Geophysical Fluid Flow Cell (GFFC) is an implementation of this ideal in which fluid is contained between two rotating hemispheres that are differentially heated and stressed with a large a-c voltage. Nonlinear mode selection and high Rayleigh number turbulence in a rotating convecting spherical shell of liquid was explored. Experiments were carried out in a low driving parameter range where some limited

numerical experimentation is currently feasible, as well as in a parameter range significantly beyond numerical computation for many years. A data analysis system was developed and several theoretical, numerical, and (terrestrial) laboratory problems which model certain aspects of the expected GFFC motions were studied. Author

N86-15773*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THEORETICAL AND EXPERIMENTAL DESIGN STUDIES FOR THE ATMOSPHERIC GENERAL CIRCULATION EXPERIMENT
William W. Fowlis, David H. Hathaway, Timothy L. Miller, Glyn O. Roberts (Roberts Associates, Inc., Vienna, Va.), and Kenneth J. Kopecky (Drake Univ.) *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 12-13 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

The major criterion for the AGCE design is that it be possible to realize strong baroclinic instability in the spherical configuration chosen. Another configuration was selected for the stability studies. In this configuration, a hemispherical shell of fluid is subjected to latitudinal temperature gradients on its spherical boundaries and the latitudinal boundaries are insulators. Work in the laboratory with a cylindrical version of this configuration revealed more instabilities than baroclinic instability. The laboratory cylindrical annulus studies were continued. Four flow regimes were identified, namely, an axisymmetric Hadley circulation, boundary layer convection, baroclinic waves and deep thermal convection and regime diagrams were prepared. Author

N86-15774*# Simpson Weather Associates, Inc., Charlottesville, Va.
MULTISCALE MODELING TO EVALUATE PROPOSED SPACE-BASED DOPPLER LIDAR SAMPLING STRATEGIES
G. D. Emmitt *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 17-18 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

Doppler lidars have a demonstrated capability to measure the line-of-sight component of the winds at ranges up to a few tens of kilometers. Ground based CW and pulsed lidars were used to obtain estimates of the three wind components by conically scanning about a vertical axis. Airborne pulsed lidars have produced two dimensional maps of the horizontal winds in a manner similar to dual Doppler radar except that the aircraft motion is used to obtain two perspectives on the target volume. A proposal has been made to place a pulsed Doppler lidar on a space platform in a low Earth orbit (200 to 800 km) to measure the atmospheric winds with a spatial resolution commensurate with the current continental rawinsonde network density - i.e., 300 to 500 km resolution. Examples of how models on all these scales were applied in an ongoing simulation study are presented. In particular, the uncertainties in a mesoscale wind estimate are separated into those arising from pulse scale variances and those due to sample distribution within a prescribed resolution volume. Trade-offs between accuracy and representativeness are discussed in terms of the model results. Author

N86-15775*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ESTIMATION OF PRECIPITATION FROM GOES IR IMAGERY DURING FGGE: APPLICATION TO DIAGNOSTIC STUDIES
Franklin R. Robertson *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 21-22 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

A method of estimating open ocean rainfall and associated latent heat release via GOES IR satellite imagery was developed. Remote precipitation estimates were used to investigate the role of diabatic forcing in the maintenance of the South Pacific Convergence Zone (SPCZ) during FGGE SOP-1. The significance of nonquasigeostrophic transports of energy in several cyclogenetic events preceding the development of North Atlantic blocking episode during FGGE SOP-1 was assessed. Author

N86-15776*# Pennsylvania State Univ., University Park. Dept. of Meteorology.
THE USE OF SATELLITE DATA IN UNDERSTANDING AND PREDICTING CONVECTIVE AND LARGE-SCALE DYNAMICAL PROCESSES
John A. Dutton, John E. Clark, and Hampton N. Shirer *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 23-25 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

Conventional and NOAA-III and NOAA-IV Earth Radiation Budget (ERB) data was combined to study the pronounced index oscillation of the 1974 to 1975 winter. The principal driving mechanism for the oscillation is barotropic wave-mean flow energy exchanges stimulated by the mean westerlies becoming periodically unstable. Polar cap radiative processes are phased with the oscillation such as to reinforce it. Variations in mid and high latitude cloud cover resulting from intrusions of warm air into high latitude regions modulate the net radiative cooling in such a way as to reinforce strong mid-latitude westerlies because of thermal wind balance and thus intensify the oscillation. A two layer truncated baroclinic spectral model was developed to study the long term evolution of disturbances to a baroclinically unstable mean flow. Topography and crudely-parameterized radiative processes were accounted for. The form-drag exerted by the topography on the barotropic part of the mean flow is larger than on the baroclinic part and thus we anticipate significant changes from the original calculations on the index oscillation when it is strongly modulated by topography. Since the index oscillation accounts for a significant portion of atmospheric temporal variance, the long term predictability could be improved if reliable forecasts of the index oscillation were available. Two spectral models of the index oscillation, one barotropic and the other baroclinic, were developed. Author

N86-15777*# Illinois State Water Survey, Champaign.
VARIATION OBJECTIVE ANALYSES FOR CYCLONE STUDIES
Gary L. Achtemeir, Stanley Q. Kidder, and Harry T. Ochs *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 26-28 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

An objective analysis technique was developed that will maximize the information content of data available from diverse sources, with particular emphasis on the incorporation of observations from satellites with those from more traditional immersion techniques. The state of the synoptic scale atmosphere was diagnosed on a much finer scale over a much broader region than is presently possible to permit studies of the interactions and energy transfers between global, synoptic and regional scale atmospheric processes. Author

N86-15778*# Purdue Univ., West Lafayette, Ind. Dept. of Geosciences.
UTILIZATION OF SATELLITE CLOUD INFORMATION TO DIAGNOSE THE ENERGY STATE AND TRANSFORMATIONS IN EXTRATROPICAL CYCLONES
Phillip J. Smith *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 29-30 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

The impact of latent release on extratropical cyclone development was investigated. Previous efforts to accomplish this task have focused on the energy balance and the vertical motion field of an intense winter extratropical cyclone over the United States. A modified form of the quasi-geostrophic height tendency equation, in which geostrophic wind components were replaced by observed winds and a latent theat release term was added, was used. This methodology was adopted to produce a simple diagnostic model

which retains the essential mechanisms of quasi-geostrophic theory but more faithfully describes observed wave development when the Rossby Number approaches and exceeds 0.5. Results to date indicate that the new model yields height tendencies that are superior to those obtained from the quasi-geostrophic formulation and are sufficiently close to the observed tendencies to be a useful tool for diagnosing the principle large-scale forcing mechanisms in the 700 to 300 mb layer. Of the three forcing terms included in the new model (vorticity advection, differential thermal advection, and differential latent heat release), vorticity advection is in general dominant for this case. Author

N86-15779*# Purdue Univ., West Lafayette, Ind. Dept. of Geosciences.
DYNAMICS AND ENERGETICS OF THE SOUTH PACIFIC CONVERGENCE ZONE DURING FGGE SOP-1
Dayton G. Vincent *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 31-33 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

It was found that wave number four plays an important role in the Southern Hemisphere tropics during the 15-day period when the SPCZ was a dominant feature, particularly with regard to the baroclinic conversion of potential to kinetic energy. The convective-active SPCZ area was found to make a significant contribution to this conversion process; thus, it appears that baroclinic effects and latent heating are important in maintaining the SPCZ. Cyclone activity within the SPCZ was examined and the heat and moisture budgets in the South Pacific was studied. It was found that cyclonic disturbances occurred with regularity in the zone from 10 to 17 January. Three cyclones, which developed and moved along the SPCZ, are being investigated. One cyclone remained tropical, while the other two propagated into middle latitudes and took on frontal characteristics. Satellite estimates have shown that areas of maximum precipitation are located in the vicinity of each cyclone. Preliminary results of budget studies show good agreement with patterns of satellite-derived precipitation. Author

N86-15780*# Texas A&M Univ., College Station. Dept. of Meteorology.
APPLICATION OF SATELLITE DATA TO TROPIC/SUBTROPIC MOISTURE COUPLING
James P. McGuirk and Aylmer H. Thompson *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 34-36 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

Analysis tools for use of satellite data to interpret synoptic-scale systems in data-void regions are under development. Interim goals are to: (1) quantify the synoptic information content of satellite data; and (2) utilize these data in the diagnosis of moisture bursts in the eastern tropical Pacific Ocean during FGGE. G.L.C.

N86-15781*# Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
OBSERVATIONAL AND THEORETICAL STUDIES OF THE EVOLVING STRUCTURE OF BAROCLINIC WAVES: ATTRACTOR DYNAMICS OF GLOBAL WEATHER SYSTEMS
Barry Salzman, Anthony R. Hansen, Richard N. Nagle, and Chung-Muh Tang (Universities Space Research Association, Columbia, Md.) *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 37-38 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

Low order modeling of global weather dynamics, passive tracer evolution, and satellite signatures of atmospheric blocking are three of the topics reviewed in the study of the evolution of the structure of baroclinic waves. G.L.C.

N86-15782*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DEEP CONVECTION IN MESOSCALE CONVECTIVE SYSTEMS
Steven J. Goodman *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 41 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

A study has been undertaken to examine the evolution of radar echoes and lightning attending the convective storms in mesoscale convective systems and the relationships between the spatial and temporal evolution of deep convection and the storm environment, precipitation, severe weather, and lightning. The total number of ground discharges ranges from 10,000 to 30,000 over the life cycle of the MCS with peak sustained rates (for up to 10 consecutive hours) in excess of 2000 per hour. The peak lightning activity occurs from 5 to 20 hours after the first storms and anywhere from 7 hours prior to 7 hours after the time of the maximum areal extent of the MCS for very similar synoptic environments. Thus, it appears that mesoscale and subsynoptic scale mechanisms are responsible for these large temporal variations in lightning activity. In addition, it was found that the lightning rates in MCS's are not related to either the size or the duration of the MCS. Preliminary results suggest that the MCS's with embedded squall lines produce the greatest flash rates. G.L.C.

N86-15783*# National Severe Storms Lab., Norman, Okla.
SEVERE STORM ELECTRICITY
W. David Rust and Donald R. MacGorman *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 42-44 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

A field program was conducted and the data analyzed. The field program incorporated coordinated measurements made with a NASA U2. Additional results from this program are also reported. Results include the following: (1) ground truth measurements of lightning; (2) analysis of meteorological radar data for lightning mapping; (3) analysis of synoptic conditions during three simultaneous storm systems; (4) analysis of extremely low frequency (ELF) waveforms; (5) an assessment of the CG strike location system; (6) photographic varification of continuing current in + CG flashes; (7) work on expansion of NSSL's lightning ground strike locating system for mesoscale studies; and (8) setup and testing of a VHF lightning mapping system for entire hemisphere continuous recording. G.L.C.

N86-15784*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
STORM SEVERITY DETECTION (RF)
R. L. Johnson (Southwest Research Inst., San Antonio, Tex.) and Steven J. Goodman *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 45-46 (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

Atmospheric electrical emissions occurring in association with Hurricane Alicia were observed by two crossed baseline phase linear interferometers. The sensors were located in San Antonio, Texas, and at Marshall Space Flight Center, Huntsville, Alabama. An analysis of the data indicated that the direction finding (DF) performance of the San Antonio site was extremely good while the DF performance at the MSFC site evidence erratic behavior. A check of the data acquisition hardware revealed an intermittent problem in one of the radio receiver channels. Since the system had experienced several lightning strikes during the early spring of 1984, it was necessary to ship the entire rack of equipment back to SwRI for refurbishment. G.L.C.

N86-15785*# Wisconsin Univ., Madison. Space Science and Engineering Center.
STUDIES OF LIGHTNING DATA IN CONJUNCTION WITH GEOSTATIONARY SATELLITE DATA
Brian Auvine and David W. Martin *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 47-48 (For primary document see

N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

The creation of an extensive real-time lightning data base accessible via the SSEC McIdas system is discussed. Contacts were made with many of the major lightning networks including MSFC, NSSL, SUNY's East Coast Network, the LPATS networks (via the National Severe Storms Forecast Center and R*Scan Corporation), and the Bureau of Land Management to arrange for access to their data during the period of May through September 1985. With the exception of the BLM which is in the process of redefining its user's policy, all of these networks have generously consented to such access on a trial basis. The purpose of this endeavor is two-fold: to enhance the availability and ease of access to lightning data among the various networks, governmental and research agencies; and to test the feasibility and desirability of such efforts in succeeding years. G.L.C.

N86-15786*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LIGHTNING MAPPER AND THE FUTURE
Hugh J. Christian *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 49-50 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

A trade-off analysis was completed that reveals how the lightning mapper detection efficiency will change as a function of interference filter bandwidth, pixel field of view, and telescope aperture. It is shown that the critical parameter on which we have minimum flexibility is filter bandwidth. The problem is that too narrow a filter bandwidth is incompatible with wide areal coverage. The trade-off analysis demonstrates that an 80 percent lightning detection efficiency will technically be relatively straightforward, while a 90 percent detection efficiency will apparently be difficult to achieve. Three focal plane designs are currently under consideration. One would use a single large, solid state silicon integrating array with multiple output channels and off-the-focal-plane analog, time domain, background removing filters. A second design would use the same technology, but the sensor would consist of up to four virtually independent focal plane arrays. This design reduces the areal coverage of each detector, thus narrower interference filters could be utilized. Superior performance would be realized at a probable increase in cost. The final design would use a three-dimensional focal plane in order to perform background removal at the focal plane. Superior performance would be achieved along with reduced weight and power requirements. Unfortunately, this focal plane technology is still under development. G.L.C.

N86-15787*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE SHUTTLE/MESOSCALE LIGHTNING EXPERIMENT
Otha H. Vaughan, Jr., B. Vonnegut (State Univ. of New York, Albany), and Marx Brook (New Mexico Inst. of Mining and Technology, Socorro) *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 51 ref (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

An experimental technique which would employ the space shuttle's television equipment for a mesoscale lightning mapping experiment is discussed. At present the exercise is in the planning stage. G.L.C.

N86-15788*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
OPTICAL CHARACTERISTICS OF LIGHTNING AND THUNDERSTORM CURRENTS
E. Philip Krider (Arizona Univ., Tucson) and Richard J. Blakeslee *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 52 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01

Lightning can be used to determine the diurnal variations of thunderstorms, i.e., storms that produce audible thunder, and that these variations are also in good agreement with diurnal variations in rainfall and convective activity. Measurements of the Maxwell current density, J sub m, under active thunderstorms show that this physical quantity is quasi-steady between lightning discharges and that lightning does not produce large changes in J sub m. Maps of J sub m show contours of iso-current density that are consistent with the locations of radar echoes and the locations of where lightning has altered the cloud charge distribution. G.L.C.

N86-15789*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
OPTICAL CHARACTERISTICS OF LIGHTNING
Steven J. Goodman *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 53-55 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

A study of the optical characteristics of cloud-to-ground discharges and how they compare with intracloud flashes was completed. Time resolved optical (7774A) and electric field-change waveforms were measured above clouds from a U2 airplane coincident with ground-based measurements of lightning. The optical pulse trains are studied for within and between flash variability. Specifically, for each flash the 10, 50 (full width half maximum), and 90 percent pulse widths; the 10-10, 10-50, 10-90, and 10-peak percent amplitude rise times; the radiances (optical power densities); radiant energy densities; and pulse intervals were examined. The optical pulse characteristics of first strokes, subsequent strokes, the intracloud components of cloud-to-ground flashes and intracloud flashes as viewed from above cloud are shown to exhibit very similar waveshapes, radiances and radiant energy densities. G.L.C.

N86-15790*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AIRBORNE ATMOSPHERIC ELECTRICITY EXPERIMENTS
Richard J. Blakeslee *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 56-57 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

During the 1984 U2 spring flight program, lightning spectra were measured in the wavelengths from 380 nm to 900 nm with a temporal resolution of 5 ms. With this capability, both visible and near-infrared lighting spectra were simultaneously acquired on a pulse to pulse basis, so that the spectral variability within a flash, as well as flash to flash variations, can be studied. Preliminary results suggest that important variations do occur, particularly in the strengths of the hydrogen and singly ionized nitrogen emission lines. Also, the results have revealed significant differences in the integrated energy distributions between the lightning spectra measured above clouds and the spectral measurements of cloud-to-ground lightning made at the ground. In particular, the ratio of the energy in the near-IR to that in the visible is around 1 to 2 for cloud top spectra versus about 1/3 for surface observations. G.L.C.

N86-15791*# California Univ., Davis. Dept. of Land Air and Water Resources.
AIRBORNE DOPPLER MEASUREMENTS OF THE CENTRAL CALIFORNIA EXTENDED SEA BREEZE
John J. Carroll *In* NASA/Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 61-62 ref (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

The objective of this project is the mapping of the complex mesoscale flow associated with the intrusion of marine air into the central valley of California. This analysis seeks to delineate the mass flow through several passes in the coastal mountains and the pattern of difluence within the valley. Additional information in the form of rawinsonde data and hourly surface meteorological data will be employed to augment this analysis. This work is expected to yield improved understanding of the kinematics and dynamics of these types of flows. Author

N86-15792*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ANALYSIS OF DOPPLER LIDAR DATA
Jeffry Rothermal *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 63-64 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

Dual Doppler lidar analyses of data taken by pulsed lidars demonstrates the feasibility of deriving wind fields from coordinated lidar scans. Limited case histories of thunderstorm outflows are obtained. Co-located comparison between lidar and 5.5 cm radar demonstrates the desirability of lidar in cases of marginal radar reflectivity in clear air and low-elevation scans. Author

N86-15793*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AIRBORNE DOPPLER LIDAR ACTIVITIES
Dan R. Fitzjarrald and J. W. Bilbro *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 65-66 (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

During August and September 1984, 20 airborne Doppler lidar research flights were conducted by the CV990 with the MSFC Airborne Doppler Lidar installed. Nine of these flights were dedicated to the Lidar project. Excellent data were obtained in the Carquenez strait downwind of San Francisco Bay, showing the divergence of the flow as it passes into the Central Valley. The data clearly show the horizontal and vertical structure of the wind flow in the pass region and adjoining parts of the Central Valley. Data were also obtained in the vicinity of Mount Shasta in northern California, showing the flow in the lee of the isolated mountain. Preliminary analyses of these flights using the Mcidas interactive graphics system have been accomplished, and procurements have been initiated for detailed scientific analyses. A partial failure of a crucial optical component resulted in contamination of a portion of the wind data that were obtained in the Mount Shasta and subsequent flights. Analyses are underway to attempt reconstruction of the data to minimize the effects of the failure. Author

N86-15794*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
RESPONSE OF THE MESOSCALE ATMOSPHERE TO DIABATIC HEATING
Franklin R. Robertson *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 69-70 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

A study is initiated to determine the influence of convective latent heat release/diabatic heating on the production of kinetic energy. The heating fields used are those derived from the diagnostic cumulus parameterization technique developed previously. The primary focus is on the relative importance of thermally forced modification of the wind field through thickness and height gradient changes versus inertial-advective effects via the diabatic component of vertical motion. Preliminary results show that because of the strong vertical shear over the convective region, ageostropic response is primarily caused by the latter process. The diagnostic parameterization of convective heating is extended for use in conjunction with satellite precipitation estimates in data-poor oceanic regions. An initial application is made to a mesoscale convective system embedded inthe South Pacific convergence zone. Comparison to the heating field diagnosed as a residual in the thermodynamic equation using the ECMWF III-b analyses shows that the methodology will be useful in explaining the observed heating fields and determining the relative contribution of moist processes to total diabatic heating. Author

N86-15795*# Wisconsin Univ., Madison. Space Science and Engineering Center.
MESOSCALE AGEOSTROPHIC CIRCULATIONS ASSOCIATED WITH BAROCLINIC JET STREAKS
Donald R. Johnson *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 71 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

The following is a list of publications and theses sponsored through the support of the NASA Severe Storms Research Project under NASA contract NAS8-33222: (1) effects of diabatic heating on the ageostrophic circulation of an upper tropospheric jet streak; (2) effects of diabatic heating on the ageostrophic circulation of an upper tropospheric jet streak; (3) the effects of the Asselin time filter on numerical solutions to the linearized shallow-water wave equations; (4) a comparison of methods for computing the sigma coordinate pressure gradient force for flow over sloped terrain in a hybrid theta-sigma model; (5) effects of diabatic heating on the ageostrophic circulation of an upper tropospheric jet streak; (6) the inducement of planetary boundary layer mass convergence associated with varying vorticity beneath tropospheric wind maximum; and (7) the inducement of planetary boundary layer mass convergence associated with varying vorticity beneath tropospheric wind maximum; and (8) numerical experiments of jet streak ageostrophic circulations using pseudo-geostrophic initialization and perspectives. Author

N86-15796*# Chicago Univ., Ill.
ANALYSIS OF SATELLITE DATA FOR SENSOR IMPROVEMENT (DETECTION OF SEVERE STORMS FROM SPACE)
T. Theodore Fujita *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 72 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

An analysis of satellite data used for the detection of severe storms from space includes the following projects: (1) a climatological study of downbursts in a six-state-area (Arkansas, Louisiana, Tennessee, Mississippi, Alabama, and Georgia); (2) studies of Huntsville area microbursts; (3) preliminary design of the MIST/SPACE/FLOWS mesonet including five Doppler radars; and (4) completion of The Downburst book. Operation of the COHMEX network serving the three component projects, SPACE (Satellite Precipitation and Cloud Experiment), MIST (Microburst and Severe Thunderstorm), and FLOWS (FAA Lincoln Lab Operational Weather Studies) is to be conducted under the direction of the principal investigators assigned to each project. Author

N86-15797*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SEVERE STORM DETECTION WITH PASSIVE 37 GHz OBSERVATIONS
Roy W. Spencer, Michael R. Howland (Wisconsin Univ., Madison), and David W. Martin (Wisconsin Univ., Madison) *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 73-74 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

The information content of satellite passive 37 GHz brightness temperatures on the severity of thunderstorms, through the measurement of the attenuation (scattering) signature of precipitation is determined. The severe storm detection potential of satellite-observed passive 37 GHz radiances is evaluated by comparing Nimbus-7 Scanning Multi-channel Microwave Radiometer (SMMR) data to reports of severe weather contained in the NSSFC severe weather log for calendar years 1979 and 1980 over the United States east of the Rocky Mountains. Author

N86-15798*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AUTOMATED MESOSCALE WINDS DERIVED FROM GOES MULTISPECTRAL IMAGERY
Gregory S. Wilson and Robert J. Atkinson (GE Co., Huntsville, Ala.) *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 75-77 ref (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

An automated technique for extracting mesoscale winds from

sequences of GOES VISSR image pairs is developed, tested extensively, and configured for quasi-real time/research applications on the Atmospheric Sciences Division's research computing system. The entire system of computer codes is successfully vectorized for execution on an array processor resulting in job turnaround in less than 1 hour. An objective quality control system provides much greater than 99 percent accuracy in eliminating questionable wind estimates. Dynamical analysis of cloud wind divergence reveals temporally consistent convergence centers on the Meso-beta scale that are highly correlated with ongoing and future developing convective storms. Author

N86-15799*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SATELLITE PASSIVE MICROWAVE RAIN MEASUREMENT TECHNIQUES FOR LAND AND OCEAN
Roy W. Spencer *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 78-79 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

Multiseasonal rainfall has been found to be measurable over land with satellite passive microwave data, based upon comparisons between Nimbus-7 Scanning Multichannel Microwave Radiometer (SMMR) brightness temperatures (T sub B) and operational WSR-57 radar rain rates. All of the SMMR channels (bipolarized 37, 21, 18, 10.7, and 6.6 GHz T sub B) are compared to radar reflectivities for 25 SMMR passes and 234 radar scans over the U.S. during the spring, summer, and fall of 1979. It is found that the radar rain rates are closely related to the difference between 37 and 21 GHz T sub B. For rain over the ocean, the 37 GHz scattering relationship derived over land (which is nearly linear) is taken and extended to the ocean environment. By utilizing the 37 GHz polarization information the highly polarized ocean can be separated from the slightly polarized rain, and the rate can then be measured. Work is continuing in the analysis of SMMR data to learn more about the multifrequency signature of precipitation over land and ocean, during various seasons and in different climatic environments. Author

N86-15800*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
REMOTE SENSING OF SEVERE CONVECTIVE STORMS
R. J. Hung (Alabama Univ., Huntsville), R. E. Smith, and G. S. West *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 80-82 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

The Tibet Plateau significantly affects the initiation and development of heavy rainfall and severe storms in China, just as the Rocky Mountains influence local severe storms in the United States. Many rain-bearing synoptic systems in China originate over the Plateau, and then move eastward and northward causing excessively heavy rains and outbreaks of severe storms in eastern and northern China. In the First GARP Global Experiment (FGGE), the American Satellite GOES-1 was moved to the Indian Ocean at 58 deg during the period of time from December 1, 1978 to November 30, 1979. The infrared and visible imagery from the GOES-1 Satellite over the Tibet Plateau were used to study the convective cloud development and the amount of rainfall over the Plateau area in comparison with that of the Rocky Mountains. Author

N86-15801*# Drexel Univ., Philadelphia, Pa. Dept. of Physics and Atmospheric Science.
LAMPS SOFTWARE AND MESOSCALE PREDICTION STUDIES
D. J. Perkey *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 83 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

The full-physics version of the LAMPS model was implemented on the Perkin-Elmer computer. The LAMPS graphics processors were rewritten to the run on the Perkin-Elmer. The impact of convective parameterized latent heat release on the evolution of a precipitating storm was investigated and the results are evaluated. The impact of initial conditions on LAMPS model results which will help define measurement requirements for future research field projects and for observations in support of operational forecasts is evaluated. The impact of parameterized latent heat on the evolution of precipitating systems is continuing. The development of methods for using satellite information, radiance and moisture information, to enhance the initial state used in the LAMPS model is planned. E.A.K.

N86-15802*# Universities Space Research Association, Rapid City, S.D.
MESOSCALE: CLOUD SCALE SIMULATION OF CONVECTIVE RESPONSE
Fred J. Kopp and Richard T. McNider (Alabama Univ., Huntsville) *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 84-86 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

The two-dimensional cloud model was used to simulate the convective response in an environment predicted by a mesoscale model. Simulation soundings were taken from the mesoscale model environment at the simulated time of 2000 Z. The seven positions in the mesoscale model represented different regions of surface heating, convergence effects and topography. The effect of the topography simulated in the mesoscale model did affect the convergence and mesoscale environment in that region which will affect the response of the cloud model to the sounding taken from that location. All of the cloud model runs were made with no ambient wind. The layer of divergence simulated a linearly increasing and then decreasing divergence value to produce a realistic horizontal wind profile resulting from the divergence. The cloud model simulates the convective activity for a period of about 2 hours with no further interaction with the mesoscale model. A convergence was held constant over the period of the simulation also. It is shown that there is a clear differential convective response due to the mesoscale model environment. E.A.K.

N86-15803*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MESOSCALE RESEARCH ACTIVITIES WITH THE LAMPS MODEL
Michael W. Kalb *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 87-88 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

Mesoscale research activities with the LAMPS model are reported. The LAMPS mesoscale model on atmospheric sciences division computer was implicated. A balanced and real wind initial states for three case studies, March 6, April 24, April 26, 1982 was derived. Numerical simulations for three separate studies were performed: (1) a satellite moisture data impact study using VAS precipitable water as a constraint on model initial state moisture analyses; (2) mesoscale model precipitation simulation accuracy with and without convective parameterization was evaluated; and (3) the sensitivity of model precipitation to mesoscale detail of moisture and vertical motion in an initial state was studied. E.A.K.

N86-15804*# Wisconsin Univ., Madison. Dept. of Meteorology.
COOPERATIVE VAS PROGRAM WITH NASA MARSHALL SPACE FLIGHT CENTER
David D. Houghton *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 89-90 (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

Progress in making the regional numerical model LAMPS on-line is discussed. The importance of mesoscale moisture information in the forecasting of weather events was studied. The precipitation forecasts were validated. Data files for LAMPS simulations are prepared. E.A.K.

N86-15805*# Wisconsin Univ., Madison. Space Science and Engineering Center.

THE ASSIMILATION OF SATELLITE SOUNDINGS, WINDS AND SATELLITE PRODUCTS IN A MESOSCALE ANALYSIS FORECAST SYSTEM

George R. Diak and William L. Smith *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 91-92 refs (For primary document see N86-15769 06-47)

Avail: NTIS HC A07/MF A01 CSCL 04B

The complimentary nature of satellite soundings and winds in a forecast/analysis system was demonstrated. Cloud drift and water vapor winds enter into the height field as gradient information. The cloud drift winds have the character of supplying information in cloudy areas where satellite soundings are not possible. Analyses and forecasts using the combination satellite winds and soundings were superior to those using only soundings. Good consistency is shown between independent satellite forecasts from different initialization times run to the same verification time. The experiments were expanded to include a quasi-continuous initialization inserting satellite soundings and winds from several different times into an analysis forecast. The forecast initialization fields were not independent, but contained satellite information from two data times. The guess field for a satellite update at 1730 GMT was a forecast from 1430 GMT analysis also containing satellite soundings and winds. The forecast produced from this multiple assimilation was good in both primary variables and precipitation. A normal model initialization procedure implemented in our mesoscale model was instrumental in reducing spurious model oscillations in this experiment. The use of the horizontal gradient information may alleviate some of the bias problems associated with the soundings. E.A.K.

N86-15806*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

NUMERICAL SIMULATION OF CONVECTIVE RESPONSE TO MESOSCALE FORCING

Richard T. McNider (Alabama Univ., Huntsville), Fred J. Kopp (Universities Space Research Association, Rapid City), Michael W. Kalb, and Gregory S. Wilson *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 93-94 ref (For primary document see N86-15769 06-47)

Avail: NTIS HC A07/MF A01 CSCL 04B

A two-dimensional mesoscale model was used to initialize a two-dimensional cloud model with both mesoscale thermodynamic and dynamic information utilized int he initialization. The Mesoscale-cloud model linkage was to examine differential convective response due to mesoscale variations. Both data analyses and mesoscale model simulations indicated strong variations in thermodynamic and dynamic structure across the panhandle of Texas where a moderately strong convective line formed. The cloud model showed a preferred area for strong convection to occur due to concomitant mesoscale convergence and mesoscale destabilization of the atmosphere. The transfer of mean mesoscale thermodynamic and dynamic structure to the cloud model with an imposed temperature perturbation to start the convection was analyzed. A more consistent mechanism would be to scale the temperature perturbation to dry convective boundary layer scales such as the convective velocity scale, and the planetary boundary layer height. The parameters are available from the mesoscale model. Fine scale structure in the cloud model initial conditions can be initialized consistent with the mesoscale model boundary layer. E.A.K.

N86-15807*# Saint Louis Univ., Mo. Dept. of Earth and Atmospheric Sciences.

A SUMMARY OF RESEARCH ON MESOSCALE ENERGETICS OF SEVERE STORM ENVIRONMENTS

Henry E. Fuelberg *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 95-97 refs (For primary document see N86-15769 06-47)

Avail: NTIS HC A07/MF A01 CSCL 04B

Interactions between areas of intense convection and their surrounding mesoscale environments by using diagnostic budgets of kinetic (KE) and available potential energy (APE). It is found that: (1) the synoptic scale storm environment contains energy conversions and transports that are comparable to those of mature midlatitude cyclones; (2) energetics in the mesoscale storm environment are often an order of magnitude larger than those in an undisturbed region; (3) mesoscale wind maxima form in the upper troposphere on the poleward sides of convective areas, whereas speeds decrease south of storm regions; (4) geopotential heights in the storm environment rise concurrent with an increase in the divergent wind component; (5) directly over storm areas, winds above approx. 350 mb decrease during convective formation, whereas they increase within the 550 to 350 mb layer; and (6) the differential changes in speed (KE) arise because of particular combinations of source/sink terms in the budget equation. E.A.K.

N86-15808*# Hayden (Christopher), Madison, Wis.

TIME COMPOSITE SOUNDING

Christopher Hayden *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 98 ref (For primary document see N86-15769 06-47)

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In the time composite sounding mode, the VAS data are collected in a series of images of one spin each rather than in the dwell sound mode where single lines are repeatedly scanned. A drawback of the time composite method is temporal smearing of the data, but to compensate this there is also the chance that shifting cloud patterns will permit better spatial coverage. It is concluded that: the time composite results were at least equivalent to the conventional dwell sounding results, despite the fact that compositing was done in a less than optimum way because of software limitations. E.A.K.

N86-15809*# Colorado State Univ., Fort Collins. Cooperative Inst. for Research in the Atmosphere.

INVESTIGATIONS OF SEVERE/TORNADIC THUNDERSTORM DEVELOPMENT AND EVOLUTION BASED ON SATELLITE AND AVE/SESAME/VAS DATA

Thomas H. VonderHaar and James F. W. Purdom *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 99-102 refs (For primary document see N86-15769 06-47)

Avail: NTIS HC A07/MF A01 CSCL 04B

Three areas in severe tornadic thunderstorm development were investigated. The areas were: (1) research of rapid scan satellite imagery to investigate the severe thunderstorm's local environment; (2) investigations of the April 10, 1979 AVE/SESAME case using rapid scan satellite imagery and AVE sounding data; and (3) investigations of VAS imagery for mesoscale applications. The rapid scan satellite imagery for severe thunderstorm's local environment is emphasized. E.A.K.

N86-15810*# Wisconsin Univ., Madison. Dept. of Meteorology.

DETECTION OF ROTATING THUNDERSTORMS USING SATELLITE IMAGERY

C. E. Anderson and Robert Schlesinger *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 103-104 refs (For primary document see N86-15769 06-47)

Avail: NTIS HC A07/MF A01 CSCL 04B

In the case of the Carolina tornadoes, visible and IR GOES imagery covering the period 2000 Z when the storm entered South Carolina from Georgia until it exited North Carolina at 0200 Z into Virginia was proposed. The GOES IR imagery demonstrated that this storm was imbedded in a continuously propagating mesolow with a well defined cold dome. The ground damage track paralleled exactly with the cold dome throughout the storm's life across the Carolinas. The Carolina storm did exhibit rightward deviating outflow which was oriented about 60 deg to the 300 mb streamlines. More spectacular was cirrus outflow from several separate thunderstorm complexes along the Carolina coasts. These outflows had almost 90 deg rightward deviation to the streamlines at their height levels. These more isolated storms developed earlier but in the same meteorological regime as did the main Carolina storm

and could have been used as an early warning that tornadic storm development had a strong likelihood over the Carolinas that day.
E.A.K.

N86-15811*# Saint Louis Univ., Mo. Dept. of Earth and Atmospheric Sciences.
STATISTICAL ANALYSIS AND USE OF VAS RADIANCE DATA
Henry E. Fuelberg *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 105-107 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

VAS radiance data, especially the 6.7 micrometer water vapor channel are used to better interpret the atmosphere's water vapor structure from 6.7 micrometer imagery. New analysis and forecasting techniques utilizing retrieved VAS soundings are explored. A dark (dry) image streak having mesoscale details was located over the special data region, and it provides the major focus of the case study. Mesoscale radiosonde-derived humidity data are found to verify fine scale features of the image that are not evident from the standard National Weather Service network. Thus, VAS imagery is a reliable detector of mesoscale moisture structure during this case. Retrieved soundings for 6 and 7 March, 1982 water vapor channel are being investigated using statistical structure and correlation function analyses. Profiles from a physical procedure (Smith, University of Wisconsin) are compared with those using a regression technique and with ground truth radiosonde data.
B.W.

N86-15812*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
IMPROVED SATELLITE RETRIEVALS AND MESOSCALE MOISTURE VARIABILITY
Gary J. Jedlovec *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 108-110 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

The investigations over the past year have led to the finalization of results from the study of mesoscale atmospheric parameters derived from the VISSIR Atmospheric Sounder (VAS). Soundings from several retrieval techniques for the 6 to 7 March, 1982 special observation period were evaluated for mesoscale accuracy. Specific results and comparisons between data from a regression and two physical retrieval schemes are discussed.
B.W.

N86-15813*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
STUDIES OF HUMID CONTINENTAL HAZE DURING SPACE
David A. Bowdle and William A. Greene *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 113-114 (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

A solar radiometer network was developed to provide supporting data during the Satellite Precipitation and Cloud Experiment (SPACE). Each of the 9 prime and 10 supplementary SPACE ground sites will be equipped with an upward pointing global solar pyranometer. About half of the sites will also be equipped with an upward pointing diffuse (shade ring) solar pyranometers, and a downward pointing global albedo pyranometer. These radiometers will be used to monitor the spatial and temporal variability of solar insolation and haze optical depth. The insolation data will ultimately be input to numerical models of the pre-storm and near-storm boundary layer. The optical depth data will be compared with simultaneous measurements from airborne and satellite-based passive visible radiometers and airborne lidars.
B.W.

N86-15814*# Alabama Univ., Huntsville. Environmental and Energy Center.
PRELIMINARY PLANNING FOR THE SATELLITE PRECIPITATION AND CLOUD EXPERIMENT (SPACE) FIELD PROGRAM
Steven F. Williams and Richard T. McNider *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 115-116 (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

Preliminary planning has been performed to support NASA/MSFC in the coordination of the field experiment to be conducted in central Tennessee and northern Alabama, and Mississippi during the spring/summer of 1986. The goal of SPACE is to investigate mesoscale cloud/precipitation systems and development of associated satellite remote sensing technology. The field program will incorporate remote sensing observations from aircraft, satellite imagery, radar observations, ground based lightning measurements, rawinsonde observations, and various surface meteorological observations. The coordination of existing and special observation networks will provide a data base for analysis of precipitation events and provide ground truth comparisons for remote sensing capabilities.
Author

N86-15815*# New Technology, Inc., Huntsville, Ala.
ATMOSPHERIC MODELING AND SENSOR SIMULATION (AMASS) STUDY
Karen G. Parker *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 117-119 ref (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

A 4800 baud synchronous communications link was established between the Perkin-Elmer (P-E) 3250 AMASS system and the Cyber 205 located at GSFC. An extensive study of off-the-shelf array processors offering standard interface of the Perkin-Elmer was conducted to determine which would meet computational requirements of the division. A Floating Point Systems AP-120B was borrowed from another MSFC laboratory for evaluation. It was determined that available array processors did not offer significantly more capabilities than the borrowed unit, although at least three other vendors indicated that standard Perkin-Elmer interfaces would be marketed in the future. Therefore, the recommendation was made to continue to utilize the 120B and to keep monitoring the AP market. Hardware necessary to support requirements of the ASD as well as to enhance system performance as specified and procured.
B.W.

N86-15816*# Wisconsin Univ., Madison. Space Science and Engineering Center.
A DESIGN STUDY FOR A THREE-DIMENSIONAL DISPLAY COMPUTER TERMINAL FOR METEOROLOGICAL INFORMATION
Verner E. Suomi, Robert J. Krauss, Bill Hibbard, and J. T. Young *In* NASA. Marshall Space Flight Center NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 121 ref (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

A design study of a three-dimensional display computer terminal for meteorological information was conducted. The software developed on this project in FY-84 was put into final form and documented for McIDAS user access. The stereo display has been used by most of the operational users of McIDAS or its progenies. Specifically, the National Hurricane Center, the National Severe Storm Forecast Center, the National Meteorological Center, and the Cape Canaveral Forecast Facility have all made use of the 4-D display techniques to help evaluate meteorological situations on various occasions.
B.W.

N86-15817*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INTERACTIVE INFORMATION PROCESSING FOR NASA'S MESOSCALE ANALYSIS AND SPACE SENSOR PROGRAM
Karen G. Parker (New Technology, Inc., Huntsville, Ala.), Laura MacLean, Norman Reavis, Gregory S. Wilson, John S. Hickey (Atsuko Computing International), Michael Dickerson (Atsuko Computing International), Shogo Karitani (Atsuko Computing International), and David Keller *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 122-135 (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

The Atmospheric Sciences Division (ASD) of the Systems Dynamics Laboratory at NASA's Marshall Space Flight Center (MSFC) is currently involved in interactive information processing for the Mesoscale Analysis and Space Sensor (MASS) program. Specifically, the ASD is engaged in the development and implementation of new space-borne remote sensing technology to observe and measure mesoscale atmospheric processes. These space measurements and conventional observational data are being processed together to gain an improved understanding of the mesoscale structure and the dynamical evolution of the atmosphere relative to cloud development and precipitation processes. Author

N86-15818*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DOPPLER WIND PROFILE EXPERIMENT
James E. Arnold *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 139 (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

The data collection phase of a Doppler wind measurement experiment supported by high-resolution Jimsphere/FPS-16 wind data and Windsonde data was carried out. The Doppler wind measurements were made using a hybrid NOAA/WPL Doppler profiler and a SOUSY profiler. Both systems operated at 50 Mhz. Although the Doppler profiler systems were located 10 km apart to enable concurrent operation of the systems for data comparison, little concurrent data were obtained due to set-up delays with the SOUSY system, and system problems with the WPL system during the last month of the test. During the test period, special serial Jimsphere soundings were taken at two-hour intervals on six days in March and April in addition to balloon soundings taken in support of the Shuttle launch operations. In addition, there is temperature, moisture and wind information available from the daily morning Radiosonde sounding taken. The balloon release point was at the same location as the SOUSY profiler. Vertical resolution of the SOUSY profiler was 150 M to approximately 20 km. The vertical resolution of the WPL profiler was 290 M to 10 km and 870 M to 17 km. Winds determined form the Jimsphere balloon have a vertical resolution of 30 M. B.W.

N86-15819*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MULTISPECTRAL ATMOSPHERIC MAPPING SENSOR OF MESOSCALE WATER VAPOR FEATURES
Paul Menzel, Gary J. Jedlovec, Greg S. Wilson, Robert J. Atkinson, and William Smith *In its* NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 140-141 refs (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01

The MAMS is being flown over the Pre-Storm network during May 1985. MAMS will be used to measure at high spatial resolution the structure and variability of water vapor in the atmosphere in relation to development of cloud fields, precipitation, surface/boundary layer forcing, and sources/sinks of water vapor. The MAMS was checked out for specified spectral response and detector noise performance in the eight visible and three infrared (6.7, 11.2, 12.7 micron) spectral bands. A calibration algorithm was implemented for the infrared detectors. Engineering checkout flights on board the ER-2 produced imagery at 50 m resolution in which water vapor features in the 6.7 micron spectral band are most striking. These images were analyzed on the Man computer Interactive Data Access System (McIDAS). Ground truth and ancillary data (VAS, AVHRR) was accessed to verify the calibration. B.W.

N86-15820*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FIRST MEETING OF THE WORKING GROUP ON THE SHUTTLE MICROWAVE PRECIPITATION RADIOMETER (SMPR)
In its NASA/MSFC FY-85 Atmospheric Processes Research Review Oct. 1985 p 142-143 (For primary document see N86-15769 06-47)
Avail: NTIS HC A07/MF A01 CSCL 04B

A summary of the consensus of opinion of the working group on the Shuttle Microwave Precipitation Radiometer (SMPR) as well as selected comments attributable to certain participants is given. The working group agreed that the first (primary) objective of such a Shuttle mission (instrument) should be the determination of methods for the accurate measurement of total rain water and total cloud water with passive microwave methods. It was noted by the group that there is merit in the evaluation of global data with high resolution at frequencies between 6 and 200 GHz, with better than 5 km resolution when possible. The first priority in meeting the precipitation measurement objective was observations at approximately 6, 10, 18, 21, 37, and 90 GHz. A second priority was the inclusion of channels near the 50 GHz oxygen absorption band so that differencing could be employed to determine the vertical extent of precipitation. A third priority was the addition of water vapor information at the 183 GHz line to study cloud systems in general. B.W.

N86-15821*# Wisconsin Univ., Madison.
SEVERE STORM IDENTIFICATION WITH SATELLITE MICROWAVE RADIOMETRY: AN INITIAL INVESTIGATION WITH NIMBUS-7 SMMR DATA
Roy W. Spencer and Michael R. Howland [1984] 15 p refs (Contract NAS8-34767; Grant NAG5-391)
(NASA-CR-176431; NAS 1.26:176431) Avail: NTIS HC A02/MF A01 CSCL 04B

The severe weather characteristics of convective storms as observed by the Nimbus 7 Scanning Multichannel Microwave Radiometer (SMMR) are investigated. Low 37 GHz brightness temperatures (due to scattering of upwelling radiation by precipitation size ice) are related to the occurrence of severe weather (large hail, strong winds or wind damage, tornadoes and funnel clouds) within one hour of the satellite observation time. During 1979 and 1980 over the United States there were 263 storms which had very cold 37 GHz signatures. Of these storms 15% were severe. The SMMR detected hail, wind, and tornadic storms equally well. Critical Success Indices (CSI's) of 0.32, 0.48, and 0.38 are achieved for the thresholding of severe vs. nonsevere low brightness temperature events during 1979, 1980, and the two years combined, respectively. Such scores are comparable to skill scores for early radar detection methods. These results suggest that a future geostationary passive microwave imaging capability at 37 GHz, with sufficient spatial and temporal resolution, would allow the detection of severe convective storms. This capability would provide a useful complement to radar, especially in areas not covered by radar. Author

N86-15822*# Wisconsin Univ., Madison. Space Science and Engineering Center.
SATELLITE MICROWAVE OBSERVATIONS OF A STORM COMPLEX: A COMPARATIVE ANALYSIS Interim Report, 1 Feb. 1984 - 30 Apr. 1985
David W. Martin Sep. 1985 43 p refs (Grant NAG5-391)
(NASA-CR-176430; NAS 1.26:176430) Avail: NTIS HC A03/MF A01 CSCL 04B

The hypothesis that cold events correspond to a particular stage in a class of thunderstorms was tested. That class is a storms class which updrafts are: (1) strong, broad and moist, and (2) extend well above the freezing level. Condition (1) implies strong mesoscale forcing. Condition (2) implies a tall updraft or a relatively low freezing level. Such storms should have big, intense radar echoes and cold, fast-growing anvils. The thunderstorm events were analyzed by radar, rain gauge and GOES infrared observations. Radar was the starting point for detection and definition of the hypothesized thunderstorms. The radar signature is compared to the signature of the storm in rain gauge observations, satellite infrared images and satellite microwave images.

N86-15823# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
VALIDATION OF OUTGOING LONGWAVE RADIATION IN THE GLAS (GODDARD LABORATORY FOR ATMOSPHERIC SCIENCES) GENERAL CIRCULATION MODEL M.S. Thesis

G. R. Borger 1985 77 p
(AD-A158006; AFIT/CI/NR-85-55T) Avail: NTIS HC A05/MF A01 CSCL 04/2

Outgoing longwave radiation (OLR) simulated by the GLAS general circulation model is validated with that derived from measurements made by polar orbiting satellites. The mean observed and simulated OLR fields are compared for spatial and seasonal variations by expanding them into spherical surface harmonics. The student's t-test is to determine the significance of differences between the simulated and observed fields. The global mean and standard deviation of the simulated geographical fields are respectively about 20 per sq Wm-2 smaller and 10 per sq Wm-2 larger than the corresponding values of the observed field. The major fraction of the variability in the simulated field is due to a sharp meridional gradient in the field. The seasonal variation of the global mean and standard derivation of the simulated fields are in good agreement with observations. Correlation coefficients between the observed and simulated fields as a function of spatial scales show that the phase relationship for large spatial scales is very good for January and July months but fair for April and October. In the tropics, the differences between simulated and observed OLR means are not significantly different from zero, except over deep convective regions (Asiatic monsoon, Amazon, Central Africa) where the model convective clouds do not interact with radiation. The differences in the middle and high latitudes are highly significant, more so in the Southern Hemisphere than in the Northern Hemisphere. Author (GRA)

N86-15824# Air Force Geophysics Lab., Hanscom AFB, Mass.
A CONCEPTUAL MODEL OF THE SEVERE-STORM ENVIRONMENT FOR INCLUSION INTO AIR WEATHER SERVICE SEVERE-STORM ANALYSIS AND FORECAST PROCEDURES Scientific Interim Report, Jan. - Sep. 1984
J. M. Lanicci 16 Nov. 1984 91 p
(AD-A158010; AFGL-TR-84-0311; AFGL-ERP-898) Avail: NTIS HC A05/MF A01 CSCL 04/2

A severe-storm conceptual model first proposed by Carlson and Ludlam is described, and its relevance to identifying potential areas for severe thunderstorms is discussed. The theory complements that of Fawbush and Miller, but revises some ideas concerning large-scale atmospheric structure preceding the outbreak of severe storms, particularly the presence of a capping inversion (or lid) in the pre-storm environment. The processes that produce the lid are then discussed along with methods for identifying the lid on both convectional pressure charts and Skew T-Log P diagrams. The diagrams are used to define a new stability index that considers the strength of the restraining inversion. Two detailed case studies are presented that illustrate the role of the lid in determining the location of severe weather and the analysis techniques used to identify the lid, and that incorporate the lid concept into the operational severe-storm analysis and forecast procedures used by the Air Weather Service. GRA

N86-15825# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A SYNOPTIC AND MESOSCALE STUDY OF A FREQUENT LIGHTNING EVENT M.S. Thesis
J. P. Alleca Jun. 1985 168 p
(AD-A158225; AFIT/CI/NR-85-75T) Avail: NTIS HC A08/MF A01 CSCL 04/2

This thesis reviews synoptic and mesoscale features associated with the lightning flash distribution of a squall line and frontal system on the 13th and 14th of June, 1984. Thunderstorms on these days produced over 68,000 cloud-to-ground flashes from 13/13Z to 15/04Z. According to Orville (1985), these flashes represented about one-third of the world's average lightning for this time interval. Emphasis is placed on the squall line on the 13th since over 70% of the lightning flashes were associated with this feature. Synoptic and mesoscale analyses along with cloud-to-ground lightning data obtained from the State University of New York at Albany (SUNYA) Lightning Detection Network are used to document the conditions that created this unusual lightning event. Time and space distributions of the lightning data are examined in terms of flash polarity, stroke multiplicities, flash strengths, and geography. In addition, satellite infrared imagery is used in an attempt to determine a relationship between cloud heights and lightning. GRA

N86-15826# Naval Postgraduate School, Monterey, Calif.
USE OF SPACE SHUTTLE PHOTOGRAPHY IN THE STUDY OF METEOROLOGICAL PHENOMENA M.S. Thesis
F. J. Svetz Jun. 1985 106 p
(AD-A159415) Avail: NTIS HC A06/MF A01 CSCL 04/2

Analysis of three atmospheric phenomena (squall line over the Gulf of Mexico on 9 April 1984, Hurricane Kamisy in the Indian Ocean 7 to 12 April 1984, and the Mauna Loa volcano smoke plume, Hawaii 7 to 12 April 1984) is performed using handheld-camera photographs from the Space Transportation System (STS) 41-C mission (6 to 13 April 1984). High resolution color photographs taken of the earth from the Space Shuttle Challenger were made available from the National Aeronautics and Space Administration (NASA) through the Space Shuttle Earth Observations Project (SSEOP). Comparison is made to collocated meteorological satellite images (DMSP, AVHRR and GOES) and conventional meteorological data to illustrate the advantages and deficiencies of these new high resolution photographic data. Author (GRA)

N86-15827# Naval Postgraduate School, Monterey, Calif.
SINGLE STATION ASSESSMENT OF ATMOSPHERIC BOUNDARY LAYER PROPERTIES IN THE EASTERN MEDITERRANEAN SEA M.S. Thesis
C. E. Sellers Jun. 1985 59 p
(AD-A159432) Avail: NTIS HC A04/MF A01 CSCL 04/2

The marine environment strongly affects the use of naval weapons and sensor systems. The ducting of electromagnetic energy is one of the most important influences in modern systems. The ability to describe the atmosphere is the first step in producing a realistic forecast. This study shows that in the eastern Mediterranean Sea the observed soundings appear to have a systematic error in the lower sections of the mixed layer. This, coupled with the synoptic scale changes in the atmosphere, causes single station forecasting scheme to fail. The thesis emphasizes two points: (1) the need for an accurate description of the atmosphere is paramount to any forecast, (2) the users of any single station forecast must use their knowledge of the models and compare the model results to the other information on hand to determine whether or not the prediction is reliable. Author (GRA)

N86-15828# Royal Signals and Radar Establishment, Malvern (England).
THE EARTH'S ATMOSPHERE: IDEAS OLD AND NEW
D. G. King-Hele Apr. 1985 42 p
(AD-A159558; RAE-TM-SPACE-351; DRIC-BR-96188) Avail: NTIS HC A03/MF A01 CSCL 04/2

This is the written version of the Milne Lecture for 1984, delivered at the Mathematical Institute, University of Oxford, on 1 November 1984. It offers a superficial survey of the modern view of the Earth's atmosphere, followed by samplings of past ideas between BC 350 and AD 1925. GRA

N86-15829# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
KITZINGEN AI, GERMANY LIMITED SURFACE OBSERVATIONS CLIMATIC SUMMARY (LISOCS). PARTS A, c-f Data Summary Report, Aug. 1974 - Jul. 1984
Jul. 1985 315 p
(AD-A159604; USAFETAC/DS-85/029) Avail: NTIS HC A14/MF A01 CSCL 04/2

A statistical data summary of surface weather observation climatology for: Kitzingen AI, Germany(West). This summary is similar to the Revised Uniform Summary of Surface Weather Observations (RUSSWO), but is based on data collected from limited-duty weather observing stations; i.e., those that take weather observations less than 24 hours a day, 7 days a week. The summary is in five parts: Part A, Weather Conditions and Atmospheric Phenomena; Part C, Surface Winds; Part D, Ceiling and Visibility;

Part E, Psychrometric Summaries; and Part F, Pressure Summaries. Note that Part B, Precipitation, is omitted. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using The Revised Uniform Summary of Surface Weather Observations (RUSSWOs), for complete descriptions of contents and instructions for use. Author (GRA)

N86-15830# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

AL JUBAYL/DHAHRAN, SAUDI ARABIA LIMITED SURFACE OBSERVATIONS CLIMATIC SUMMARY (LISOCS). PARTS A, c-f Data Summary Report, Jun. 1975 - Dec. 1984

May 1985 447 p

(AD-A159605; USAFETAC/DS-85/013) Avail: NTIS HC A19/MF A01 CSCL 04/2

A statistical data summary of surface weather observation climatology for: Al Jubayl Idhanran, Saudi Arabia. This summary is similar to the Revised Uniform Summary of Surface Weather Observations (RUSSWO), but is based on data collected from limited-duty weather observing stations; i.e., those that take weather observations less than 24 hours a day, 7 days a week. The summary is in five parts: Part A, Weather Conditions and Atmospheric Phenomena; Part C, Surface Winds; Part D, Ceiling and Visibility; Part E, Psychrometric Summaries; and Part F, Pressure Summaries. Note that Part B, Precipitation, is omitted. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using The Revised Uniform Summary of Surface Weather Observations (RUSSWOs), for complete descriptions of contents and instructions for use. Author (GRA)

N86-15831# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

DAKAR SENEGAL LIMITED SURFACE OBSERVATIONS CLIMATIC SUMMARY (LISOCS). PARTS A, c-f Data Summary Report, Jun. 1975 - May 1985

Sep. 1985 279 p

(AD-A159606; USAFETAC/DS-85/048) Avail: NTIS HC A13/MF A01 CSCL 04/2

A statistical data summary of surface weather observation climatology for: Dakar Senegal. This summary is similar to the Revised Uniform Summary of Surface Weather Observations (RUSSWO), but is based on data collected from limited-duty weather observing stations; i.e., those that take weather observations less than 24 hours a day, 7 days a week. The summary is in five parts: Part A, Weather Conditions and Atmospheric Phenomena; Part C, Surface Winds; Part D, Ceiling and Visibility; Part E, Psychrometric Summaries; and Part F, Pressure Summaries. Note that Part B, Precipitation, is omitted. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using The Revised Uniform Summary of Surface Weather Observations (RUSSWOs), for complete descriptions of contents and instructions for use. Author (GRA)

N86-15832# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

TAHITI ISLAND PACIFIC LIMITED SURFACE OBSERVATIONS CLIMATIC SUMMARY (LISOCS). PARTS A, c-f Data Summary Report, Jun. 1975 - May 1985

Sep. 1985 277 p

(AD-A159607; USAFETAC/DS-85/049) Avail: NTIS HC A13/MF A01 CSCL 04/2

A statistical data summary of surface weather observation climatology for: Tahiti Island, Pacific Ocean. This summary is similar to the Revised Uniform Summary of Surface Weather Observations (RUSSWO), but is based on data collected from limited-duty weather observing stations; i.e., those that take weather observations less than 24 hours a day, 7 days a week. The summary is in five parts: Part A, Weather Conditions and Atmospheric Phenomena; Part C, Surface Winds; Part D, Ceiling and Visibility; Part E, Psychrometric Summaries; and Part F, Pressure Summaries. Note that Part B, Precipitation, is omitted. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using The Revised Uniform Summary of Surface Weather Observations (RUSSWOs), for complete descriptions of contents and instructions for use. Author (GRA)

N86-15833# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

PIRMASENS AHP DL, WEST GERMANY LIMITED SURFACE OBSERVATIONS CLIMATIC SUMMARY (LISOCS). PARTS A, c-f Data Summary Report, Jun. 1975 - May 1985

Sep. 1985 144 p

(AD-A159608; USAFETAC/DS-85/053) Avail: NTIS HC A07/MF A01 CSCL 04/2

A statistical data summary of surface weather observation climatology for: Pirmasens AHP, West Germany. This summary is similar to the Revised Uniform Summary of Surface Weather Observations (RUSSWO), but is based on data collected from limited-duty weather observing stations; i.e., those that take weather observations less than 24 hours a day, 7 days a week. The summary is in five parts: Part A, Weather Conditions and Atmospheric Phenomena; Part C, Surface Winds; Part D, Ceiling and Visibility; Part E, Psychrometric Summaries; and Part F, Pressure Summaries. Note that Part B, Precipitation, is omitted. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using The Revised Uniform Summary of Surface Weather Observations (RUSSWOs), for complete descriptions of contents and instructions for use. Author (GRA)

N86-15834# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F FORT BELVOIR/DAVISON AAF, VIRGINIA Data Summary Report, Jun. 1976 - May 1985

Sep. 1985 297 p

(AD-A159609; USAFETAC/DS-85/054) Avail: NTIS HC A13/MF A01 CSCL 04/2

A six-part statistical data summary of surface observation climatology for: Fort Belvoir, Davison AAF, Virginia. Summary consists of: Part A, Weather Conditions and Atmospheric Phenomena; Part B, Precipitation; Part C, Surface Winds; Part D, Ceiling and Visibility; Part E, Psychrometric Summaries; Part F, Pressure Summaries. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using the Revised Uniform Summary of Surface Weather Observations (RUSSWOs) for complete descriptions of contents and instructions for use. GRA

N86-15835# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

YONGSAN RESERVATION, KOREA LIMITED SURFACE OBSERVATIONS CLIMATIC SUMMARY (LISOCS). PARTS A, c-f Data Summary Report, Jul. 1974 - Jun. 1984

Jun. 1985 212 p

(AD-A159610; USAFETAC/DS-85/022) Avail: NTIS HC A10/MF A01 CSCL 04/2

A statistical data summary of surface weather observation climatology for: Yongsan Reservation South Korea. This summary is similiar to the Revised Uniform Summary of Surface Weather Observations (RUSSWO), but is based on data collected from limited-duty weather observing stations; i.e., those that take weather observations less than 24 hours a day, 7 days a week. The summary is in five parts: Part A, Weather Conditions and Atmospheric Phenomena; Part C, Surface Winds; Part D, Ceiling and Visibility; Part E, Psychrometric Summaries; and Part F, Pressure Summaries. note that Part B, Precipitation, is omitted. See SAFETAC/TN-83/001 (AD-A132 186), An Aid for Using the Revised Uniform Summary of Surface Weather Observations (RUSSWOs), for complete descriptions of contents and instructions for use. GRA

N86-15836# International Meteorological Inst., Stockholm (Sweden). Arrhenius Lab.

[ACTIVITIES REPORT IN METEOROLOGY] Annual Report, Jul. 1983 - Jun. 1984

Dec. 1984 44 p refs

(AR-83/84; ISSN-0349-0068) Avail: NTIS HC A03/MF A01

Research in dynamic meteorology and climatology; chemical meteorology and biogeochemistry; and atmospheric physics is summarized. International assessment of environmental effects of increased anthropogenic CO2 production is described. Atmospheric modeling; orography; atmospheric circulation; wet deposition; atmosphere-ground interaction; the carbon cycle; and aeronomy are discussed. Author (ESA)

N86-15837# Royal Netherlands Meteorological Inst., De Bilt. Climatological Div.

CLIMATOLOGICAL DATA OF STATIONS IN THE NETHERLANDS. NO. 24: A CLIMATOLOGY OF AMSTERDAM AIRPORT FOR THE PERIOD 1951 - 1980

1985 33 p In ENGLISH and DUTCH

(KNMI-150-24; B8569019) Avail: NTIS HC A03/MF A01

Meteorological observations concerning temperature and precipitation during 1 January 1951 through 31 December 1980, are presented. Monthly and decadal means and absolutes of highest and lowest temperatures were calculated from daily values observed between 06.00 and 18.00 hours UT, and between 18.00 and 06.00 hours UT (April to September) or 18.00 and 08.00 hours UT (October to March). Monthly mean lowest grass minimum temperatures were calculated from daily observed lowest temperatures in the past 24 hours at 08.00 hours UT and measured 10 cm above ground level. Seasonal, monthly, and decadal means and absolutes were calculated daily precipitation values, measured from a 200 sq cm funnel aperture at 18.00 hours UT Decadal mean frequencies of maximum temperatures of 20.0, 25.0, 30.0 deg or higher, groundfrost, frostdays, and icedays were calculated per 10 years. Author (ESA)

N86-15838# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abteilung Wolkenphysik.

RESULTS OF ICING FLIGHTS IN WINTER 1983/84: ICE ACCRETION THICKNESS IN CORRELATION WITH CLOUD PHYSICAL PARAMETERS, OBJECT AND CLOUD PARAMETERS

Hans-Eberhard Hoffmann, Roland Roth, and Johann Demmel May 1985 46 p refs In GERMAN; ENGLISH summary

(DFVLR-FB-85-39; ISSN-0171-1342) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 16

Twenty-five icing flights on a DO 28 research aircraft were carried out to determine the correlation between ice accretion thickness on standard cylinders and cloud physical parameters (liquid water content, temperature, particle phase and size), object parameters (cylinder diameter) and cloud parameters (cloud altitude, location coordinates, time, stratus or cumulus). The relationship between ice accretion thickness and water content is demonstrated with the ice accretion model of the Canadian National Research Council. Effects of the cloud particle size on ice accretion thickness could not be shown. The ice accretion thickness change due to liquid water content depends on cylinder diameter. Liquid water content, ice accretion thickness, and icing degree increase with altitude. Stratus or cumulus has no effect on the ice accretion thickness. Author (ESA)

N86-15503# Joint Publications Research Service, Arlington, Va.

MATHEMATICAL MODELING OF MAIN LIGHTNING STAGE Abstract Only

B. N. Gorin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 53 Transl. into ENGLISH from Elektrichestvo (Moscow, USSR), no. 4, Apr. 1985 p 10-16 (For primary document see N86-15484 06-31)

Avail: NTIS HC A05/MF A01

N86-15696# Hokkaido Univ., Sapporo (Japan). Dept. of Geophysics

THE REDUCTION OF NOCTURNAL COOLING VALUE BY SMUDGING

Toshio Harimaya, Masayuki Maki, Katsuhiro Kikuchi, Takashi Taniguchi, Chikashi Hiramatsu, and Satoshi Azumane *In its* Geophysical Bulletin of Hokkaido Univ., No. 46 Oct. 1985 p 1-11 refs In JAPANESE; ENGLISH summary (For primary document see N86-15695 06-42)

Avail: NTIS HC A05/MF A01

N86-15697# Hokkaido Univ., Sapporo (Japan). Meteorological Lab.

OBSERVATIONS ON THE ATMOSPHERIC ELECTRICAL ENVIRONMENT OF SEA FOG IN THE PACIFIC COAST OF EASTERN HOKKAIDO, JAPAN

Masashi Yoshihiro, Takashi Taniguchi, and Katsuhiro Kikuchi *In its* Geophysical Bulletin of Hokkaido Univ., No. 46 Oct. 1985 p 13-31 refs In JAPANESE; ENGLISH summary (For primary document see N86-15695 06-42)

Avail: NTIS HC A05/MF A01

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N86-15839 North Carolina State Univ., Raleigh.

PROPERTIES OF THE INTERNAL WAVE FIELD ON THE EQUATOR Ph.D. Thesis

Chong-Kung Wu 1985 88 p

Avail: Univ. Microfilms Order No. DA8518289

The objectives of this thesis are: (1) to investigate the relationship between high frequency velocity fluctuations observed on the equator and linear internal waves; (2) to analyze the temporal variability of the equatorial internal wave field; and (3) to calculate statistical properties of the equaorial internal wave field and determine whether or not it is horizontally isotropic as well as vertically homogeneous and uniform in spectral slope to within a WKB scaling. Data from subsurface moored current meters were Fourier analyzed into frequency spectra, and statistical hypotheses were tested using the F-distribution for ratios of samles variances. It is concluded that the observed motions within the internal wave frequency band are consistent with the linear internal waves, the variability of the equatorial internal wave field at seasonal time scale is significant with high wave energy arising in the months of May to June and October to November. The horizontal velocity is anisotropic, particulary at times of high wave energy, with preferred meridional orientation. The distribution of kinetic energy is vertically homogeneous to within a WKB scaling. The power law for spectral slope with frequency is about -2. Seasonal variability and horizontal anisotropy observed in these equatorial data are contrary to the canonical internal wave field description put forth from mid-latitude observations. Dissert. Abstr.

N86-15840 Rhode Island Univ., Kingston.

OBSERVATIONS OF EQUATORIALLY TRAPPED WAVES IN THE EASTERN ATLANTIC OCEAN FROM INVERTED ECHO SOUNDERS Ph.D. Thesis

Laurence L. Miller 1984 133 p

Avail: Univ. Microfilms Order No. DA8516684

The measured vertical acoustic travel time data and ambient noise measured wind speed data from 0 deg, a topographically smooth region in the eastern equatorial Atlantic, are used to study the properties of equatorially trapped waves on two time scales and seasonal. Sharp spectral peaks are found in the travel time records at periods between 71 and 130 hours, coinciding with the predicted periods of several resonant, low meridional mode, first vertical mode inertia-gravity waves. The inverted echo sounder appears to be responding to vertically propagating waves with vertical wavelengths comparable to the first vertical mode. Prominent standing mode waves could be established without the strict requirement of zero zonal energy flux. Simultaneous observations of thermocline depths, sea surface temperature (SST), and local wind peed from 0 deg 4 deg are used to test the hypothesis that seasonal upwelling in the eastern equatorial Atlantic is caused by a remotely forced, equatorially trapped Kelvin wave. No

significant changed was noted in the local wind speed. It seems that local forcing could not nave caused the rise of the thermocline. A revised Kelvin wave scenario is suggested to explain the different timing of the observations. Dissert. Abstr.

N86-15841 Rhode Island Univ., Kingston.
DYNAMICS AND STRUCTURE OF GULF STREAM MEANDERS NORTHEAST OF CAPE HATTERAS, N.C. Ph.D. Thesis
William Edward Johns 1984 261 p
Avail: Univ. Microfilms Order No. DA8516676

Three arrays of inverted echo sounders (IES) and deep current meter moorings were deployed on the continental slope. This array continuously monitored the path of the Gulf Stream and the deep currents under it. The deep velocity fluctuations were characterized by a transition from transverse flow aligned with the local bathymetry for periods longer than 10 to 14 days, to fluctuations with a cross-stream orientation at shorter periods. The vertical structure, kinematics, and horizontal phase variations of the low-frequency motions are consistent with the properties of topographic-Rossby waves, while horizontal phase variations associated with higher-frequency motions are consistent with the observed dispersion of near-surface meanders. Considerations of the nondiffusive fluctuating heat equation for deep layers suggests a 3-term balance between local rate of change, cross-stream horizontal advection, and vertical advection of temperature, with the first two being of like sign. The description is consistent with the nonormal-flow boundary condition in this region, where the bottom slope is about a factor of two larger than the slope of the isotherms. Dissert. Abstr.

N86-15842 Delaware Univ., Newark.
DEVELOPMENT OF SLOPE SPECTRA OF THE WIND-DISTURBED WATER SURFACE Ph.D. Thesis
Stephen Perry Haimbach 1985 202 p
Avail: Univ. Mirofilms Order No. DA8517671

An optical system for determining two-dimensional slope spectra of the wind-distributed water surface was developed. The system consists of a collimated light source, a high-speed photodiode matrix camera, two digital wave-height probes, a computer interface, and a digital computer. Time series of highly resolved two-dimensional water-surface slopes were obtained in a wind wave tank. The wave energy spectrum is very narrow in the tank; consequently, the slope spectrum for the gravity region is not well developed. The variation of the spectral coefficient for the capillary region has four ranges. At low and intermediate winds, the coefficient is associated with boundary layer regimes and wave phase velocity. For higher wind speeds there are two ranges where the coefficient is affected by the saturation of the upwind-downwind and crosswind components of the capillary wave spectrum. The spectrum becomes more isotropic as the wind speed increased. Empirical expressions are proposed to describe the details of the growth and saturation of the directional slope spectrum. The coupling between the capillary waves and the surface drift current is determined and a modified dispersion relationship is proposed. Dissert. Abstr.

N86-15843 Rhode Island Univ., Kingston.
THE CARBON DIOXIDE SYSTEM AND ITS ROLE ON TRACE METAL CHEMISTRY IN THE MARINE ENVIRONMENT Ph.D. Thesis
Wilaiwan Thumtrakul 1985 163 p
Avail: Univ. Microfilms Order No. DA8516688

An equilibrium model was used to predict the changes in inorganic speciation of trace metals in the marine environment due to changes in water properties. The range of speciation in near-surface ocean waters was based on the chemical characteristics of a highly productive region off Peru. The salinity of these waters was nearly constant at about 35%. The only significant chemical property that would affect the speciation of trace metals in the region off Peru was pH which ranged from 7.75 to 8.37 in the upper 30 meters. Hydroxy complexes were the major forms of iron (3). Changes in pH were important for the speciation of Pb(2) and Cu(2) for which carbonate complexes were the major species. For Mn(2) and Fe(2), free ions and their chloro complexes contributed more than 90% of the total species. The chemical speciation of Mn(2) at various salinites was also examined. The amount of MnCl+ complexes increased from less than 0.1% in world-average river water to about 30% in seawater of salinity 35%. Dissert. Abstr.

N86-15844# Coastal Engineering Research Center, Vicksburg, Miss.
THE TMA SHALLOW-WATER SPECTRUM DESCRIPTION AND APPLICATIONS Final Report
S. A. Hughes Dec. 1984 45 p
(AD-A157975; CERC-TR-84-7) Avail: NTIS HC A03/MF A01 CSCL 08/3

Recent advances have been made in the specification of a shallow-water self-similar spectral form. This spectral form, referred to as the TMA spectrum, substitutes an expression for the shallow-water equilibrium range into the JONSWAP equation for spectral energy density. The JONSWAP parameters are empirically defined through examination of over 2,800 wind sea spectra obtained at various depths and locations. This spectral form is intended to describe single-peaked wind seas which have reached a growth equilibrium in finite depth water. The purposes of this report are to summarize the recent advances, to discuss the range of practical usage, and to provide engineering examples using these new formulations. Author (GRA)

N86-15845# Naval Postgraduate School, Monterey, Calif.
MIZLANT 84 DATA REPORT RESULTS OF AN OCEANOGRAPHIC CRUISE TO THE GREENLAND SEA, AUGUST-SEPTEMBER 1984 Interim Report, 1 Aug. 1984 - 1 Jun. 1985
R. H. Bourke and R. G. Paquette May 1985 156 p
(AD-A157997; NPS68-85-018) Avail: NTIS HC A08/MF A01 CSCL 08/10

This report presents plots of property profiles for each of the 333 oceanographic stations occupied by the U.S. Coast Guard Icebreaker over the continental shelf waters off the east coast of Greenland in August and September 1984. A Neil Brown Mark 3 CTD was used to obtain temperature and salinity profiles to the sea floor in shallow water and at least to 600 m in deeper water. In addition to temperature and salinity profiles, plots of sound speed and density (sigma-t) are shown. GRA

N86-15846# Naval Oceanographic Office, Bay St. Louis, Miss.
DESCRIPTION, ANALYSIS, AND PREDICTION OF SEA-FLOOR ROUGHNESS USING SPECTRAL MODELS Ph.D. Thesis
C. G. Fox Apr. 1985 233 p
(AD-A158000; NOO-TR-279) Avail: NTIS HC A11/MF A01 CSCL 08/10

A method has been developed which allows a valid statistical model of the variability of oceanic depths to be derived from existing digital bathymetric soundings. The bathymetry of the world ocean has been mapped using a variety of acoustic sounding instruments and traditional contouring methods. The bathymetric contours represent a low-frequency, deterministic model of the seafloor. To describe the higher frequency variability, or roughness, of the seafloor requires the development of an appropriate statistical method for generating a valid stochastic model. The smooth contoured surface (often preserved as a geographic grid of depths), when supplemented by such a roughness model, provides a complete description of the relief. The statistical model of the seafloor roughness is also a valuable tool for predicting acoustic scattering and bottom loss, and in addition contains a wealth of geological information for interpreting deep-sea processes. GRA

N86-15847# Oregon State Univ., Corvallis. Coll. of Oceanography.
TOWED THERMISTOR CHAIN OBSERVATIONS DURING MILDEX (MIXED LAYER DYNAMICS EXPERIMENT)
R. J. Baumann, L. M. DeWitt, C. A. Paulson, J. V. Paduan, and J. D. Wagner Jun. 1985 129 p
(Contracts N00014-79-C-0004; N00014-84-C-0218)

(AD-A158304; REF-85-12) Avail: NTIS HC A07/MF A01 CSCL 08/10

Observations of temperature and pressure in the upper 115 m of the Pacific Ocean were taken with a towed thermistor chain during October and November, 1983, as a part of the Mixed Layer Dynamics Experiment (MILDEX). The MILDEX area was approximately 400 nautical miles west of Santa Barbara. The chain was towed on four occasions for a total distance of approximately 2500 km. The observations were averaged over sequential 30-second intervals and isotherms depths were interpolated from the averaged observations. Cross-sections of temperature and isotherm depth are presented. GRA

N86-15848# Naval Postgraduate School, Monterey, Calif.
WAVE AND SURF FORECAST MODEL EVALUATION FOR USE ON A MICRO COMPUTER M.S. Thesis
L. E. Devendorf Jun. 1985 67 p
(AD-A159063) Avail: NTIS HC A04/MF A01 CSCL 08/3

A sea swell and surf model is implemented in BASIC, tested and evaluated on a micro computer (HP-9845B). The two-dimensional model includes spectral wind-wave generation in open water, and shallow water wave transformation over irregular topography. The model predicts surf zone width, breaker lines and types of breakers. Using change in momentum flux of gravity waves (radiation stress) as forcing, the model predicts current velocities within the surf zone. The model is evaluated for the conditions over constant depths and uniform sloping beaches. The numerical results are checked against accepted theory and field observations. The model is found to overbuild wind generated sea heights for a 30 kts wind but to give expected wave heights for a 15 kts wind. The model results compare well with observed nearshore wave heights but give poor location of breaking waves. The model's nearshore current calculation is found unsuitable for the HP-9845B due to computational instability and time requirements. The sources of the model's problems are identified, and recommendations are made for future improvements of the model. GRA

N86-15849# Naval Postgraduate School, Monterey, Calif.
TEMPORAL AND SPATIAL DISTRIBUTIONS OF ARCTIC SEA ICE THICKNESS AND PRESSURE RIDGING STATISTICS Final Report, Dec. 1983 - Mar. 1985
R. P. Garrett and R. H. Bourke Mar. 1985 163 p
(AD-A159577; NPS68-85-009) Avail: NTIS HC A08/MF A01 CSCL 08/12

Data from the unclassified literature were reviewed to determine the regional and seasonal distributions of sea ice thickness, pressure ridging statistics, frequency of occurrence of polynyas, and keel/sail height ratios. Seasonal and regional maps and histograms of these properties were constructed. The majority of the data were obtained from submarines equipped with a narrow-beam, upward-looking sonar. As determined from an analysis of 17 submarine cruises, the overall mean thickness of Arctic sea ice above 65 deg N, including both deformed and undeformed ice, is 2.9 m with a standard deviation of 1.8 m. The overall seasonal mean ranges from approximately 2.4 m in spring to 3.3 m in summer. Local mean ice thicknesses ranged from less than 1 m near the marginal ice zone to greater than 7 m to the north of the Canadian Archipelago. Histograms of sea ice thickness reflect a bimodal distribution in winter and spring, an effect of the presence of thin first year ice. Due to ice melt in summer and autumn only a single mode of much thicker multi-year ice is observed. GRA

N86-15850# Institute of Oceanographic Sciences, Wormley (England).
THE CTD DATA FROM THE NORTHEAST ATLANTIC 22 N-33 N, 19 W-24 W, JULY 1983. DISCOVERY CRUISES 138, 139.
P. M. Saunders and Amanda Manning (Oxford Univ., England) 1984 114 p refs
(Contract DoE-DGR-481/176)
(IOS-188; DoE/RW-85/007) Avail: NTIS HC A06/MF A01

Lists and graphs of CTD data from 27 stations in the vicinity of 32 deg 30'N 20 W, 150 miles West of Madeira, in support of an experiment to investigate the benthic boundary layer on the lower continental rise (in water depths 4000 to 5000 m) are presented. South of this location stations were occupied along longitude 24 W culminating in a series on the lower continental rise near 23 N. All CTD data were reconciled with reversing thermometer observations and with measurements of salinity and dissolved oxygen derived from samples. Author (ESA)

N86-15851# Institute of Oceanographic Sciences, Wormley (England).
CTD DATA FROM THE NORTHEAST ATLANTIC OCEAN 40-48 N, 12-21 W COLLECTED ON RRS DISCOVERY CRUISE 132 IN FEBRUARY 1983
R. T. Pollard 1985 48 p refs
(Contract EEC-CL115UK(H))
(IOS-192) Avail: NTIS HC A05/MF A01

The CTD data collected in an area northeast of the Azores bounded by 40.5 N, 48.5 N, 20.5 W and 12 W are presented. Twenty-nine stations were occupied, mostly to 1000 or 1200 dbar. Calibration and data editing techniques are described. The data are presented as potential temperature/salinity curves, profile plots of temperature, salinity, oxygen and density against pressure, and listings at standard levels of basic and derived values.
Author (ESA)

N86-15852# Institute of Oceanographic Sciences, Wormley (England).
THE IOS GEOPHYSICAL DATA HELD ON MAGNETIC TAPE - SUMMARY. BATHYMETRIC, MAGNETIC AND GRAVITY DATA COLLECTED DURING MARINE GEOLOGY AND GEOPHYSICS CRUISES 1973 - 1984
S. Drake and P. R. Miles 1985 127 p refs
(IOS-194) Avail: NTIS HC A07/MF A01

Bathymetric, magnetic and gravity data collected during marine geology/geophysics cruises are presented. Track charts and a 5 deg square data identification system provide basic cruise information useful in locating required data coverage.
Author (ESA)

N86-15853# Institute of Oceanographic Sciences, Wormley (England).
A RE-ANALYSIS OF SWOP DATA
M. A. Srokosz, P. G. Challenor, and A. D. Margetts 1985 37 p refs
(IOS-195) Avail: NTIS HC A03/MF A01

Analysis of stereophotographic data to produce information about the spatial statistics of waves on the sea surface is shown. It is clear from the analysis that the resolution (9.144 m) of the data is too poor to obtain conclusive answers to questions such as the importance of nonlinearity for the spatial statistics of waves. However, the analysis indicates that with better spatially resolved stereophotographic data it is possible to calculate parameters of interest, particularly those of importance in analyzing the radar altimeter return signal from the sea surface. Spatial resolution better than 1.5 m is needed. Author (ESA)

N86-15854# Institute of Oceanographic Sciences, Taunton (England).
A NUMERICAL MODEL OF THE TURBULENT BOUNDARY LAYER BENEATH SURFACE WAVES AND TIDES
H. L. King, A. G. Davies, and R. L. Soulsby 1985 90 p refs
Sponsored by UK Department of the Environment
(IOS-196) Avail: NTIS HC A05/MF A01

A numerical model for horizontally uniform, turbulent, oscillatory flow above a flat rough bed is applied to surface wave-induced and tidal boundary layer flows. The formulation of the problem involves the governing horizontal momentum equations, and closure assumptions which relate the turbulent shear stresses to the mean velocity gradients in the flow. The closure scheme is a standard description of the turbulence field in terms of the turbulent energy equation. This equation, together with various turbulence scaling laws, allows the eddy viscosity to be determined as a function of

height and phase angle in the wave cycle. The calculated eddy viscosity distribution is used in the finite difference solution of the governing momentum equations. Results show that the model is useful for the study of rough turbulent oscillatory boundary-layers, and that it predicts quite well the gross features of surface wave-induced and tidal flows. Author (ESA)

N86-15855# Institute of Oceanographic Sciences, Wormley (England).
THE PERMEABILITY AND CONSOLIDATION OF DEEP SEA SEDIMENTS
P. J. Schultheiss and D. E. Gunn 1985 92 p refs
(Contract DoE-DGR-481/179)
(IOS-201; DoE/RW-84/202) Avail: NTIS HC A05/MF A01

An apparatus which enables sea sediment permeability to be measured at decreasing void ratios during a back-pressured consolidation test in the laboratory was developed. Data from over 60 samples establish the major differences in permeability between various sediment types and how permeability changes as a function of burial depth and void ratio. Samples from two study areas in the North Atlantic Ocean, King's Trough Flank (KTF) and Great Meteor East (GME), were compared with samples of Red Clay (RC) obtained from the NW Pacific Ocean. The permeability of the nannofossil turbidites in the GME area is 0.00001 mm/sec, but increases to 0.001 mm/sec in their silty bases. The marls and oozes in the KTF area generally have higher permeabilities (0.00005 mm/sec). Permeabilities of the RC samples range from 0.0001 near the surface to < 0.0000001 mm/sec at a sub-bottom depth of 170 m. Author (ESA)

N86-15856# Institute of Oceanographic Sciences, Birkenhead (England).
AUTOMATIC CALIBRATION OF THE TEMPERATURE CHANNEL ON BANDERAA RECORDING CURRENT METERS
D. Flatt 1985 15 p ref
(IOS-206) Avail: NTIS HC A02/MF A01

Calibration of an ocean current meter is described. The system is reliable enough to be run overnight unattended, reducing electrical and acoustic noise in the laboratory. The temperature calibrations produced are done to a standard format with a high level of repeatability and a minimum of effort. This enables the time spent on post and pre cruise calibrations to be kept to a minimum, with the facility to do more detailed calibration if required. Using this system the standard calibration run takes 10hr and an accuracy of 10 m/deg C is achieved. Author (ESA)

N86-15857# Royal Netherlands Meteorological Inst., De Bilt. Centrale Weerdienst.
AN OPERATIONAL WAVE MODEL FOR THE NORTH ATLANTIC OCEAN [EEN OPERATIONEEL GOLFMODEL VOOR DE NOORDATLANTISCHE OCEAAN]
M. J. M. Saraber 1985 51 p refs In DUTCH; ENGLISH summary
(KNMI-WR-85-3; B8566672; ISSN-0169-1651) Avail: NTIS HC A04/MF A01

A numerical computer model to forecast daily North Atlantic Ocean Waves 5 days in advance was developed. Ship routing demands, such as fuel consumption optimization and more detailed spectral wave information are met. Using an existing North Sea model and an (ECMWF) atmospheric model for the 1000-mb windfield input, the energy balance is solved by splitting the energy into sea wind energy and swell energy. Input wind fields and calculated wave fields are compared with manually constructed wavecharts. Results of the model are plotted in such a way that useful information about sea wind and swell is given.Author (ESA)

N86-15858# Royal Netherlands Meteorological Inst., De Bilt. Centrale Weerdienst.
THE EFFECT OF THE WIND IN THE EEMSMOND (THE NETHERLANDS, WEST GERMANY) ON HIGH TIDE LEVELS IN DELFZIJL (THE NETHERLANDS) [HET EFFECT VAN DE WIND IN DE EEMSMOND OP HOOGWATERSTANDEN IN DELFZIJL]
J. Vinke Apr. 1985 9 p In DUTCH
(KNMI-TR-63; B8564433; ISSN-0169-1708) Avail: NTIS HC A02/MF A01

Differences between calculated and measured high tide level deviations in Delfzijl are investigated in order to establish a possible impact of nearby marine works on the water level. German Hydrographic Institute data concerning water levels in Borkum from November 1983 to April 1984, were compared with Delfzijl data. In Borkum no such works were executed, differences are possibly due to wind effects in the Eemsmond. However, calculations on the relations between wind velocity/direction and measured water levels show an effect which is much less than was expected. It is concluded that the average 32 cm high tide level difference between Delfzijl and Borkum is due to tide amplitude differences. It is also noted that the low tide levels of Delfzijl are often much lower than those Borkum. Author (ESA)

N86-15698# Hokkaido Univ., Sapporo (Japan). Dept. of Geophysics.
A NUMERICAL STUDY ON THE RESPONSE OF THE TROPICAL PACIFIC SEA SURFACE TEMPERATURE TO A SUDDEN CHANGE OF WIND STRESS
Kensuke Takeuchi *In its* Geophysical Bulletin of Hokkaido Univ., No. 46 Oct. 1985 p 33-41 refs In JAPANESE; ENGLISH summary (For primary document see N86-15695 06-42)
Avail: NTIS HC A05/MF A01

N86-15699# Hokkaido Univ., Sapporo (Japan). Dept. of Geophysics.
A NUMERICAL MODELLING OF THE SEASONAL VARIATION OF THE TROPICAL PACIFIC SEA SURFACE TEMPERATURE
Kensuke Takeuchi *In its* Geophysical Bulletin of Hokkaido Univ., No. 46 Oct. 1985 p 43-52 refs In JAPANESE; ENGLISH summary (For primary document see N86-15695 06-42)
Avail: NTIS HC A05/MF A01

N86-15700# Hokkaido Univ., Sapporo (Japan). Dept. of Geophysics.
A NUMERICAL SIMULATION OF COASTAL MIXED LAYER BY A MODIFIED 1-D DKT MODEL
Sei-ichi Kanari and Momoki Koga *In its* Geophysical Bulletin of Hokkaido Univ., No. 46 Oct. 1985 p 53-68 refs In JAPANESE; ENGLISH summary (For primary document see N86-15695 06-42)
Avail: NTIS HC A05/MF A01

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N86-15859# School of Aerospace Medicine, Brooks AFB, Tex.
POTENCY OF PHOTOFLASH-PRODUCED RETROGRADE AMNESIA IN RATS Final Technical Paper, Dec. 1983 - Mar. 1984
K. R. Page and T. G. Wheeler Jul. 1985 12 p
(AF Proj. 7757)
(AD-A159149; USAFSAM-TP-85-1) Avail: NTIS HC A02/MF A01 CSCL 05/9

A photoflash has been shown to be an effective amnesiac under certain conditions. The objective of this study was to evaluate the effectiveness of a photoflash in relation to the potency of the preceding event, a foot shock of varying intensities. The task was a single avoidance-trial paradigm. The subject was placed in a small aversive chamber with a door that allowed the subject to enter a large, preferred chamber. Once inside the preferred chamber, the subject received a 1-s foot shock followed by a photoflash. On the avoidance trail, the subject was again placed in the aversive chamber and the time required to enter the preferred chamber was measured. If the photoflash had produced retrograde amnesia (RA), the time required to enter would be small. Retrograde amnesia was demonstrated for the 80-, 85-, and 100-V foot-shock test trials. At 40 V the voltage may not have been great enough to be felt by the subject. For groups examined at shock levels above 100 V, the foot shock was so potent that a photoflash was ineffective in producing RA. Our conclusion was that the photoflash

was an effective amnesiac until the intensity of the foot shock became more potent than the photoflash; this is consistent with the recency theory generated in serial learning and memory tasks. GRA

N86-15860# California Inst. of Tech., Pasadena. Lab. of Chemical Physics.
APPLICATION OF ELECTRON-TRANSFER THEORY TO SEVERAL SYSTEMS OF BIOLOGICAL INTEREST
R. A. Marcus and N. Sutin 1985 9 p refs Presented at the Workshop on Antennas and Reaction Centers of Photosynthetic Bacteria - Structure, Interactions and Dynamics, Feldafing, West Germany, 23 Mar. 1985 Brookhaven National Lab., Upton, N.Y.
(Contract DE-AC02-76CH-00016)
(DE85-015835; BNL-36836; CONF-8503159-1) Avail: NTIS HC A02/MF A01

Electron-transfer reaction rates are compared with theretically calculated values for several reactions in the bacterial photosynthetic reaction center. A second aspect of the theory, the cross-relation, is illustrated using protein-protein electron transfers. DOE

N86-15861# Case Western Reserve Univ., Cleveland, Ohio.
ELECTRON REACTIONS IN MODEL AND BIOLOGICAL SYSTEMS
G. Bakale 1985 6 p refs Presented at DOE Radiological and Chemical Physics Contractors' Meeting, Richland, Washington, 9 Apr. 1985
(Contract DE-AC02-78EV-04746)
(DE85-016062; CONF-8504170-1) Avail: NTIS HC A02/MF A01

Our pulse-conductivity studies of electrons in nonpolar liquids and reversed-micellar solutions in which electron mobilitis, (MU) sub e 's, that range from < 10 to the power -3 to > 1000 sq cm/Vs and electron-attachment rate constants, k sub e 's, that range from < 10 to the 8th power to > 10 to the 14th power MM to the - 1 s to the - 1 will be briefly described as well as the mechanisms of electron transport and attachment that are consistent with this millionfold range of (MU) sub e's and k sub e 's. Included among the electron-attachment results presented will be the K sub e's of > 150 chemicals that have been classified using animal tests as being carcinogens or noncarcinogens. The k sub e-carcinogenicity correlation will be compared with the bacterial mutagenicity-carcinogenicity correlation which is the basis of the Ames Salmonella bioassay, the short-term test that is most widely used to screen potentially carcinogenic chemicals. Finally, our use of the Ames Salmonella tester strains as a biological detector of electrophilic carcinogens will be discussed. DOE

N86-15862# Oak Ridge National Lab., Tenn.
FREEZING OF LIVING CELLS
P. Mazur 1985 24 p refs Presented at the 2nd National Summer School on Cryobiology and Freeze-Drying, Toulbuchin, Bulgaria, 1 Aug. 1985
(Contract DE-AC05-84OR-21400)
(DE85-016297; CONF-8508116-1) Avail: NTIS HC A02/MF A01

It can be calculated that a living cell will survive more than 5000 years at -196 C. This ability to essentially stop biological time has important implications in medicine and agriculture, and in biological research. In medicine the chief implications are in the banking of transplantable tissues and organs and in vitro fertilization. In agriculture the applications stem in part from the role of frozen embryos in amplifying the number of calves produced by high quality cows. The problem is how can cells survive both the cooling to such very low temperatures and the return to normal temperatures. The answers involve fundamental characteristics of cells such as the permeability of their surface membranes to water and solutes. These characteristics determine whether or not cells undergo lethal internal ice formation and other response during freezing and thawing. DOE

N86-15863# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Abt. Weltraumbiologie.
INVESTIGATIONS OF THE EFFECTS OF GRAVITY ON PARAMECIUM CAUDATUM STRUCTURE AND BEHAVIOR Thesis - Bonn Univ.
Ruth Hemmersbach Jul. 1985 70 p refs In GERMAN; ENGLISH summary Report will also announced as translation (ESA-TT-963)
(DFVLR-FB-85-40; ISSN-0171-1342) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 27

Paramecium caudatum was used to study the behavior of the contractile vacuolar system, the nutrient uptake, cyclose, multiplication rate, and ultrastructure under simulated weightlessness using a fast-running clinostat and a modified agar method. In comparing 0 and 1 g behavior, no modification is detected, except for the vacuolar system. The slowed and irregular functioning behavior of the contractile vacuolar system due to an inner timing modification is influenced by gravity. Negative geotaxis of Paramecium caudatum is not confirmed. The effects of gravity on vacuole formation, situation, and number cannot be determined. Author (ESA)

N86-15864# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Abteilung Biophysik.
ON THE EFFECTS OF X IRRADIATION ON THE BACILLUS SUBTILIS SPORES IN A DAY AND WET SYSTEM Thesis - Fachhochschule, Giessen, West Germany
Eduard Woizenko Apr. 1985 82 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-968)
(DFVLR-FB-85-44; ISSN-0171-1342) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 29

Bacillus subtilis spores were irradiated to study the influence of intracellular water and to explain the modulating role of water in the development of biological radiation damage. The effects of repair deficiency in mutants regarding sensitivity to radiation in dry and wet systems were studied to explain the damage process in correlation with cell water content. The experiments were verified in multiplication rate and lag phase curves. Wild and mutant species are more sensible to ionizing radiation in a dry medium than in a wet medium. The water content used as a radiation protective substance reduces inactivation. Rec+ species (wild species) is more sensitive to ionizing radiation under extremely dry conditions and in a vacuum than Rec- species (mutants) due to a reduced repair ability. Rec- species deficient in the Rec A gene develop other repair processes to compensate for damage. The results show the variety of the cell repair processes. Author (ESA)

N86-15865# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 19, NO. 4, JULY - AUGUST 1985
O. G. Gazenko, ed. 4 Nov. 1985 156 p refs Transl. into ENGLISH of Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul.-Aug. 1985 96 p
(JPRS-USB-85-006) Avail: NTIS HC A08

Biological and medical problems encountered in space flight are the subjects of journal articles from the U.S.S.R. Some sample titles are: (1) determining human physical work capacity; (2) effect of threat stress on psychomotor stability of pilots differing in anxiety levels; (3) effect of 7 day immersion hypokinesia on characteristics of precision movements; (4) long term rotation of rats as applied to the problem of artificial gravity; (5) microflora of chufa, a potential higher plant component of biological life support systems for man; (6) crew training; and (7) automatic determination of cardiac output from rheogram of the trunk. For individual titles, see N86-15866 through N86-15892.

N86-15866# Joint Publications Research Service, Arlington, Va.
PROBLEMS OF STUDYING FLIGHT WORK IN SOVIET AVIATION MEDICINE OF THE 1920'S - 1930'S **c52**
V. M. Munipov *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 1-10 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 4-11 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

Multifaceted investigations of the flying work by Soviet aviation

medicine in the 1920 to 1930s are described. The early stages of the professional activity that is at present termed ergonomic foundations of the design, manufacture and use of the aircraft are examined. One of the first formulations of the problem of standardization of the human factors is discussed. Author

N86-15867# Joint Publications Research Service, Arlington, Va.
SOME ASPECTS OF DETERMINING HUMAN PHYSICAL WORK CAPACITY UNDER HYPERBARIC CONDITIONS c54
L. A. Bryantseva and A. Ye. Mikhnenko *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 11-23 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 11-19 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

Physical work capacity of man during real and simulated dives is discussed in view of the reported data. The parameter is known to decrease as the breathing gas density and immersion depth increase. The factors limiting the work capacity growth are as follows: greater respiration resistance, higher energy cost of ventilation, CO2 retention, dyspnea, adverse circulation changes. During exposure hyperbaric bradycardia occurs both at rest and upon a work load. This precludes prediction of physical work capacity on the basis of the heart rate alone as a parameter used in a normobaric environment. Tabulated data on the work capacity of divers at various depths obtained by different authors is presented. Author

N86-15868# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF FACTORS DETERMINING PILOT'S GEOCENTRIC ORIENTATION c53
V. V. Lapa, Ye. Ye. Bukalov, and N. A. Lemeshchenko *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 24-30 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 19-23 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

The use of a rational (geocentric) method of orientation in flight is determined by the specific content of the conceptual model that develops in the course of lying experience and by the display of the spatial position of perceptive signs of the geocentric system of coordinates. The importance of these factors is confirmed by a shorter time and a lower number of errors made in assessing the spatial position when the display presented signs of the geocentric system of coordinates. These concepts are studied through flight simulation and flight tests. Author

N86-15869# Joint Publications Research Service, Arlington, Va.
EFFECT OF THREAT STRESS ON PSYCHOMOTOR STABILITY OF PILOTS DIFFERING IN ANXIETY LEVEL c53
J. Terelak and J. Maciejczyk *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 31-34 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 24-26 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

The apparent anxiety as a personality factor cannot serve as a differentiating factor in the performance of psychomotor tasks (oculomotor coordination). It is shown that when pilots manifest a higher level of anxiety, performing specific tasks, their physiological expenditures increase. Author

N86-15870# Joint Publications Research Service, Arlington, Va.
USE OF FLIGHT SIMULATORS FOR DEMONSTRATION OF FUNCTIONAL CAPACITIES OF FLIGHT PERSONNEL c53
V. A. Bodrov, A. A. Kupriyanov, and V. V. Kharin *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 35-39 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 26-29 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

Psychophysiological parameters of 89 pilots were examined when they performed flight tasks under normal and complicated conditions. The experiments helped to reveal a group of test subjects (11.2%) who had low capabilities and made serious errors. The results obtained suggest that psychophysiological examinations during stimulated professional activity can be recommended as a method to be used for measuring adaptive and compensatory capabilities of pilots undergoing medical expertise. Author

N86-15871# Joint Publications Research Service, Arlington, Va.
EFFECT OF LEVEL OF PHYSICAL ACTIVITY ON LIPID METABOLISM OF FLIGHT PERSONNEL c52
V. I. Libkind and V. D. Vlasov *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 40-43 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 29-31 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

Lipid metabolism of healthy pilots was investigated and verified by the PWC sub 170 test. Pilots with a lower physical activity showed high levels of cholesterol, triglycerides, total lipids, LDL and low levels of HDL as averaged per group. The PWC sub 170 value and the concentration of lipid fractions in blood were found to be highly correlated, the correlation being nonlinear. The nonlinear regression data suggest that greater physical activity leads to a decrease of the lipid concentration and an increase of the content of high density lipid-protein complexes. Author

N86-15872# Joint Publications Research Service, Arlington, Va.
OXYGENATION AND REGIONAL CIRCULATION IN GINGIVAL MUCOSAL TISSUES UNDER EFFECT OF HEAD-TO-PELVIS (+Gz) ACCELERATIONS c52
S. I. Volvach, Ye. A. Kovalenko, L. I. Voronin, N. V. Ulyatovskiy, V. K. Gabyshev, V. I. Nikiforov, and V. V. Arkhipov *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 44-49 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 31-35 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

The information content of a new rheopolarographic procedure used to determine the oxygen balance and regional circulation of the gingival mucosa was measured, bearing in mind the applicability of the procedure as an objective index of human tolerance to +Gz acceleration. It was found that the parameters of the oxygen balance and regional circulation of the gingival mucosa were well correlated with blood pressure in the floor of the auricle. In contrast to the traditional methods for assessing tolerance to acceleration, the new procedure provides information about the health condition of the centrifuged subjects on a continuous basis. Variations in the oxygen balance and regional circulation of the gingival mucosa helped to identify compensatory reactions of the cardiovascular system in response to +Gz acceleration. Author

N86-15873# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF SOME ASPECTS OF HUMAN AMINO ACID METABOLISM DURING 120-DAY ANTIORTHOSTATIC HYPOKINESIA c52
T. F. Vlasova, Ye. B. Miroshnikova, and A. S. Ushakov *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 50-53 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 35-38 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

The free amino acid pool of blood of man exposed to 120-day head-down tilt (at -4 deg) was examined. Beginning with bed rest day 28 and till the end of the study, the amino acid pool increased. The increase involved most free amino acids which was produced

by a decline of anabolic and stimulation of catabolic processes during hypokinesia. Author

N86-15874# Joint Publications Research Service, Arlington, Va.
EFFECT OF 7-DAY IMMERSION HYPOKINESIA ON CHARACTERISTICS OF PRECISION MOVEMENTS c52
L. S. Grigoryeva and I. B. Kozlovskaya *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 54-59 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 38-42 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

Experiments were carried out to study the effect of 7-day immersion hypokinesia on precision movements that included reproduction of a certain isometric strain of leg muscles and angular displacement of the ankle relative to the 90 deg position. Precision disorders were seen in the structure of movements which lost their stereotypic pattern and became fragmentary, transforming into slow approximate movements versus the pattern of preimmersion movements that were of a rapid programmed control type. Precision changes during plantar flexion movements were usually excessive, hypermetric and almost twice longer than preimmersion. The origin of the above precision changes seems to be primarily associated with muscle atonia. At the same time data analysis shows that in nearly 50% of cases the values of precision changes in movements of various types (efforts and displacements) and different directions (plantar and dorsioflexion) were correlated. This is suggestive of common central mechanisms underlying their development. Author

N86-15875# Joint Publications Research Service, Arlington, Va.
EFFECT OF DRY IMMERSION MODEL ON PARAMETERS OF FLUID-ELECTROLYTE METABOLISM, BLOOD PLASMA ALDOSTERONE AND CORTISOL LEVELS IN INDIVIDUALS DIFFERING IN BODY FLUID CONTENT c52
M. A. Yunusov, V. N. Orlov, and T. V. Vinokhodova *In its* USSR Report: Space Biology and Aerospace Medicine Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 60-64 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 42-45 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

Experiments were carried out to study the effect of dry immersion on fluid-electrolyte metabolism, aldosterone and cortisol content in 22 test subjects with varying content of water in the organism. It was found that dry immersion produced a diuretic effect and facilitated a higher excretion of electrolytes and a lower aldosterone content. The test subjects with a higher content of water in the organism (16 subjects) exhibited a more distinct and prolonged polyuria. During the recovery period the aldosterone content increased insignificantly and failed to return to the baseline level, in contrast to the subjects with a normal content of water in the organism. Author

N86-15876# Joint Publications Research Service, Arlington, Va.
INTENSITY OF LIPID PEROXIDATION IN HYPOKINETIC RAT TISSUES
T. Ye. Shidlovskaya *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 65-69 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 45-48 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

The intensity of lipid peroxidation in the homogenates and mitochondria of the liver, heart and skeletal muscle of hypokinetic rats was measured. The primary products of lipid peroxidation, i.e., diene conjugates, were accumulated in all tissues on hypokinesia days 3, 15 and 30. The content of the final product--malonic dialdehyde--in the mitochondria increased on hypokinesia days 15 and 30. The low level of NADPH, an ascrobate-dependent lipid peroxidation, in the mitochondria at early stages of hypokinesia (up to 15 days) and diene conjugates in homogenates on hypokinesia day 7 can be attributed to an activation of the protective systems of the organism against the immobilization stress. It is suggested that at early stages of hypokinesia the process of lipid peroxidation, or to be more precise, lipid hydroperoxidation can be blocked. Author

N86-15877# Joint Publications Research Service, Arlington, Va.
EFFECT OF 24,25-DIHYDROXYVITAMIN D3 ON OSTEOGENETIC PRECURSOR CELLS IN IMMOBILIZED RATS
V. N. Shvets, T. Ye. Burkovskaya, Z. Ye. Vnukova, and O. Ye. Kabitskaya *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 70-76 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 48-53 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

The experiments were carried out on Wistar SPF rats that were immobilized for 35 days. By heterotopic marrow cell transplantation under the kidney capsule to the normal rates and by cloning these cells in vitro it was found that osteogenetic potentials were significantly inhibited and the amount of osteogenetic precursor cells was reduced. The addition of 24,25(OH)2D3 vitamin (at a dose of 1.25 micrograms per day) to the animal die led to the normalization of the above parameters. It is assumed that immobilization-associated osteoporosis develops via, among other mechanisms, inhibition of histogenesis of stromal precursor cells. The beneficial role of vitamin D3 is actually the activation of histogenesis of these cells which results in the recovery of bone remodelling during immobilization. Author

N86-15878# Joint Publications Research Service, Arlington, Va.
BASIC RESULTS OF EXPERIMENTS WITH LONG-TERM ROTATION OF RATS AS APPLIED TO THE PROBLEM OF ARTIFICIAL GRAVITY
A. R. Kotovskaya, I. B. Krasnov, and A. A. Shipov *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 77-81 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 53-57 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

Rats housed as a group per cage were centrifuged for 21 and 30 days at 1.1. and 2.0 G. The following parameters were measured: (1) motor activity, body mass, static and dynamic endurance, acceleration (+Gz) tolerance, vestibular function, equilibrium function, skeletal muscle contractility, bone dynamics, gas exchange, blood biochemistry, weight of adrenals, thymus and thyroid gland; (2) morphology of adrenals, thyroid gland, and cortex of the cerebellum nodulus; and (3) biochemistry of blood hormones, energy metabolism enzymes in the liver, bone phosphatase, myosin Ca-Mg-ATPase in the myocardium, protein sulfhydryl groups in the cerebellar motor cortex. It was demonstrated that prolonged (1/50 of their life time) centrifugation of unrestrained rats causes no deterioration of many physiological functions, i.e., rotation produces no adverse effects on the animal body. Author

N86-15879# Joint Publications Research Service, Arlington, Va.
MAN'S TOLERANCE TO FULMINANT FORM OF HYPOXIC HYPOXIA c52
A. Yu. Katkov, Ye. P. Vyazova, R. N. Chabdarova, I. S. Krikun, and Zh. M. Kudryashova *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 82-86 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 57-60 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

Rapidly progressing, or fulminant form of hypoxic hypoxia is among the extreme factors to which one is exposed in case of depressurization of a flight vehicle. It can be simulated by means of breathing with inert gas. The results of testing reactions to fulminant hypoxia elicited by breathing nitrogen are presented in this report. B.W.

N86-15880# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF CATECHOLAMINE METABOLISM AT HIGH ALTITUDES c52
N. A. Davydova, Yu. A. Senkevich, M. B. Belakovskiy, and S. V. Samratova *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 87-91 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 60-63 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

The function of the sympathoadrenal system (SAS) measured with respect to the content of epinephrine and norepinephrine in blood and urine as well as dopamine and DOPA in urine of mountaineers and athletes nontrained to high altitudes was examined. It was found that the mediator component of the SAS was activated in the athletes and that the adaptive capability of the SAS of the mountaineers was adequately high. Author

N86-15881# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF INCREMENT OF BACILLUS SUBTILIS BIOMASS IN WEIGHTLESSNESS
F. Bergter, D. Harz, P. J. Muller, K. Mund, U. Gunter, T. Hesse, R. Hartmann, G. Wanke, M. G. Tairbekov, G. P. Parfenov et al *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 92-95 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 63-65 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

This paper presents the results of a microbiological experiment carried out by the Soviet and GDR scientists onboard SALYUT-6. The experiment was performed using a Bacillus subtilis suspension in the Jena unit. The purpose of the experiment was to study the time-course variations of the cell biomass increase in zero-g. The cell culture development was measured with respect to the utilization rate of glucose or casein hydrolysate in the nutrient medium and the rate of protein accumulation in cells. It has been shown that the rate of biomass increment in zero-g lags behind the 1 g level. It can be concluded that the decreased metabolic activity of bacterial cells in zero-g is associated with changes in the cell population distribution and physiochemical parameters of the nutrient medium. Author

N86-15882# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF MICROFLORA OF CHUFA, A POTENTIAL HIGHER PLANT COMPONENT OF BIOLOGICAL LIFE-SUPPORT SYSTEMS FOR MAN
L. S. Yunusova and N. A. Drugova *In its* USSR Report: Space Biology and Aerospace Medicine Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 96-100 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 65-68 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

The microbiological characteristics of the chufa plant grown alone or in combination with wheat and vegetables were investigated. The results showed that the bacterial flora of chufa plants did not change significantly. The bacterial count decreased during nodule formation. The number of actinomycetes increased when chufa and wheat plants were grown together. By the end of vegetation fungi were accumulated in the chufa rhizosphere. Among the physiological groups involved in the transformation of nitrogen-containing compounds ammonifiers were predominant. At the germination stage ammonification and denitrification processes increased, cellulose-decomposing bacteria appeared, oligonitrophilic forms occurred. From the microbiological point of view chufa plants can be used in the higher plant component of the biological life support system. Author

N86-15883# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF DISTINCTIONS REFERABLE TO GROWTH, DEVELOPMENT AND METABOLISM OF CLOSTERIOPSIS ACICULARIS ALGAE WHEN CELLS ARE LIMITED IN NITROGEN AS RELATED TO BIOLOGICAL LIFE-SUPPORT SYSTEMS FOR MAN
A. A. Antonyan, M. A. Levinskikh, and N. I. Sukhova *In its* USSR Report: Space Biology and Aerospace Medicine Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 101-108 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 69-73 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

The growth, development and metabolism of a new form of green unicellular algae Closteriopsis acicularis were investigated from the point of view of their potential use in the biological life support system (BLSS). Their growth and biochemical characteristics were studied as a function of nitrogen supply. During the nitrogen-deficiency cultivation the growth rate remained unchanged, cell division and biomass increment was uncoupled, and carbohydrate formation was predominant. The content of carbohydrates increased at the expense of assimilable fractions, particularly starch. These data can be used in the selection of an optimum nitrogen level for the case of algal continuous cultivation, in the development of diets that can be provided by a BLSS incorporating Closteriopsis acicularis. Author

N86-15884# Joint Publications Research Service, Arlington, Va.
FORMATION OF VOLATILE SUBSTANCES DURING POLYMER DESTRUCTION BY PSEUDOMONAS AERUGINOSA c27
N. D. Novikova and S. N. Zaloguyev *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 109-113 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 74-76 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

The effect of biodestruction of paint-and-varnish coatings on the formation and evolution of toxic substances was studied. It was found that the multiplication of Pseudomonas aeruginosa on epoxide resins (EP-255+EP-525/AK-070) modified the evolution of gases: that of actone and n-butanone increased and evolution of xylene and ethyl benzene isomers decreased. Author

N86-15885# Joint Publications Research Service, Arlington, Va.
ONE ASPECT OF CREW TRAINING c53
Ye. D. Konovalov *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 114-119 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 77-80 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

This paper describes the psychophysical training of crewmembers of flying vehicles who may find it necessary to cross a water boundary or to remain for long in water after emergency splashdown. In order to prevent attacks of fear and panic caused by such frightful things as whirlpools and convulsions, the paper presents data on the nature of turbulent processes in running water and the techniques of overcoming them as well as on the origin of convulsions in swimmers and methods of their alleviation. B.W.

N86-15886# Joint Publications Research Service, Arlington, Va.
METHOD OF CALCULATING ANGULAR DIMENSIONS OF FLIGHT VEHICLE COCKPIT CANOPY CASINGS c54
A. V. Lekarev *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 120-124 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 81-83 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

The view from flight vehicle (FV) cockpits is an important factor in assuring flying safety and providing comfortable conditions for the pilot's visual observation of space outside the cockpit. At the present time, transparent parts of most cockpits in different types of FV are executed in the form of flat panels installed into the

metal frame of the cockpit canopy. Presence of opaque components (casings) in the cockpit canopy results in obscuring part of the outside area, which worsens viewing conditions from the pilot's work place. In order to improve the view from FV cockpits with flat transparent parts, a method was developed for calculating the angular dimensions of casings (seams) on the basis of distinctions of human binocular vision. The proposed method makes it possible to meet the requirements as to strength features of the canopy frame and provide for comfortable viewing conditions outside the cockpit. The method is based on crossed diplopia in an empirical horopter from a point of the cyclopic eye of the observer. B.W.

N86-15887# Joint Publications Research Service, Arlington, Va.
INFORMATIVENESS OF ECHO SIGNAL IN PULSED ULTRASONOGRAPHY OF THE BRAIN (WITH USE OF MODEL) c52
L. G. Simonov, L. A. Rozenblyum, and N. N. Bogdanova *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 125-130 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 83-85 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

A change in hydrostatic pressure leads to change in intracranial volumetric relationships (IVR) of liquid media, which has a substantial effect on intracranial pressure and blood supply to the brain. As a noninvasive method of assessing IVR, one can use ultrasonic pulsed probing of the walls of the cerebral ventricles. However, because of its low noise immunity and several other factors that affect the amplitude of the echo signal, the reliability of such a method for evaluation of IVR of liquid media is not satisfactory. A method of probing intracranial structures is described in which the ultrasonic pulse penetrates through the frontal bone, passes through the ventricle and is reflected from the stationary occipital bone. A model was developed to determine the informativeness of an echo obtained in this manner. It was demonstrated on this model that a change in level of the echo signal is elicited by change in ventricular volume. The base width of the ventricle causes this to be a monotone function. It was shown that such a probing method is less sensitive to change in acoustic properties of brain tissue than ultrasonic methods involving direct probing of ventricular walls. B.W.

N86-15888# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF POSSIBILITY OF USING TWO-FREQUENCY IMPEDOMETRY FOR ESTIMATION OF PROPORTION OF TOTAL AND EXTRACELLULAR BODY FLUIDS c52
V. P. Krotov, Ye. G. Bazunova, and B. S. Kulayev *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 131-136 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 86-89 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

According to the results of postflight examination of cosmonauts, exposure to weightlessness leads to changes in fluid-electrolyte metabolism and in ratio between liquid phases of the body. It is not possible to establish the kinetics of fluid redistribution in the body as a function of duration of weightlessness, since a method has not yet been found that would permit measurement of body fluids and proportion of each in flight. Recently, works have been published, which report that it is possible to determine the ratio of total body fluid to its extracellular component. This is done by concurrently determination of impedance (Z) in the measured section of the body during passage of current through it at different frequencies. However, all of the studies cited above have a clinical and physiological orientation, with which it is impossible to determine distinctly the quantitative relationship between total fluid and its extracellular component. The objective in this research is to explore the possibility of using two-frequency impedometry to determine the quantitative ratio between total body fluid and its extracellular component. B.W.

N86-15889# Joint Publications Research Service, Arlington, Va.
AUTOMATIC DETERMINATION OF CARDIAC OUTPUT FROM RHEOGRAM OF THE TRUNK c52
I. V. Sokolova and L. A. Khryashcheva *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 137-140 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 89-90 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

Depending on the method of recording the trunk rheogram (TRG) and theoretical validation of formulas for subsequent calculations, many rheographic analogues of characteristics of cardiac output are calculated from the amplitude and period of the TRG with use of appropriate multiplicative coefficients. The technical execution of the system for automatic determination of characteristics of cardiac output on the TRG in the form of an algorithm for a computer does not impose restrictions on structure and number of coefficients, and it offers broad research opportunities for studying them in comparison of rheography to other methods. The algorithm for automatic determination of cardiac output features from the TRG is developed in this investigation in the form of a set of programs in the FORTRAN-IV algorithmic language for YeS or SM series computers, and it solves the following problems: (1) isolation of rheowave as the valid signal in the presence of interference, (2) identification of elements in the rheowave structure for the duration of the cardiac cycle, (3) calculation of rheographic characteristics of cardiac output for the cardiac cycle, and (4) statistical averaging of rheographic characteristics of cardiac output in a specified interval for a specified level of significance. B.W.

N86-15890# Joint Publications Research Service, Arlington, Va.
FUNCTIONAL STATE OF THE OLFACTORY ANALYZER IN A PRESSURIZED ENVIRONMENT c52
S. S. Pashin and G. I. Solomin *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 141-144 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 90-92 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

Man's long-term presence in pressurized environments (PE) imposes certain requirements of the composition of the artificial atmosphere in space vehicles. It is important for there to be no odors of various impurities. The latter is attributable to the range of reflex effects of chemicals through receptors of the upper respiratory tract on other analyzers, functional state of the central nervous system, various organs, systems and the body as a whole. It is particularly undesirable to have persistent odorous stimuli in the atmosphere of a pressurized environment, and for this reason odorimetric studies are a mandatory stage of setting hygienic standards. However, such studies are performed under ordinary laboratory conditions, without consideration of the possible functional changes in the olfactory analyzer related to long-term isolation of an individual. An attempt was made in this research to demonstrate any possible functional changes in the olfactory analyzer during long-term exposure of man to the artificial atmosphere of a pressurized chamber. B.W.

N86-15891# Joint Publications Research Service, Arlington, Va.
GAS CHROMATOGRAPHIC ANALYSIS OF FREE FATTY ACIDS OF SKIN SURFACE LIPIDS c52
V. P. Maydina, B. L. Avetisyants, and D. M. Dubinin *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 145-148 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 93-94 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

The basic components of sebaceous gland secretions are triglycerides, which are hydrolyzed to free fatty acids, monoglycerides and diglycericdes on the skin surface, under the effect of

lipases of microorganisms and other factors. Studies of the microflora of the skin surface revealed that it contains aerobic staphylococci, anaerobic propionobacteria and fungi which have lypolytic activity. A correlation was establishment between quantity of microorganisms of the micrococcus family and acne propionobactria on the skin, on the one hand, and rate of formation of free fatty acids (FFA) of sebum cutneum, on the other band. The bactericidal and fungicidal properties of the skin are attributed to the presence of FFA on its surface. The authors of hypotheses on the pathogenesis of acne simplex believe that inflammation of the follicular wall of a sebaceous gland is related to the irritating effect of FFA. Because of the high sensitivity and informativeness of gas chromatography, it has gained wide use in the last 10 years in biomedical investigations. The objective here was to develop a gas chromatography method for examining the FFA of sebum cutaneum. B.W.

N86-15892# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF MINERAL NUTRITION OF A NEW FORM OF MICROALGAE TO BE USED IN BIOLOGICAL LIFE-SUPPORT SYSTEMS
M. A. Levinskikh and O. G. Livanskaya *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 149-151 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 95-96 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

Closteriopsia acicularis var. africana Hind unicellular green algae attracted the attention of researchers because, unlike Chlorella, it has a readily broken down cell membrane and, according to preliminary data, its biomass contains considerable amounts of readily assimilated carbohydrates. It is felt that inclusion of this alga in the photoautotrophic part of a biological life-support system (BLSS) for man could optimize its features considerably. One of the main questions in studying unicellular algae as applied to human BLSS is their biogenic element requirements. Such knowledge is necessary in order to provide optimum mineral nutrition for algae and high productivity, but mainly to maintain these conditions on a specific level during continuous cultivation in the mode of medium recirculation, which requires constant replenishment of biogenic elements in strict accordance with their removal with the collected harvest. Data was obtained on biogenic element requirements of algae during accumulating cultivation under different cultivation conditions. B.W.

N86-15893# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENCE AND TECHNOLOGY
9 Oct. 1985 73 p refs Transl. into ENGLISH from various East European articles
(JPRS-ESA-85-031) Avail: NTIS HC A4/MF A01

Progress in science and technology in East European countries is reported. Topics discussed include: German-Soviet joint training of electrical engineers, advanced process for metal glass which failed industrial adaptation, advances in radio biological research; advances in optoelectronic, nuclear reactor, radiobiological research. For individual titles, see N86-15894 through N86-15896.

N86-15894# Joint Publications Research Service, Arlington, Va.
ADVANCES IN RADIOBIOLOGICAL RESEARCH: HYPOXIC IRRADIATION EFFECTS
A. M. Dancewicz and M. M. Jelenska *In its* East Europe Report: Science and Technology (JPRS-ESA-85-031) 9 Oct. 1985 p 7-13 refs Transl. into ENGLISH from Nukleonika (Warsaw, Poland), no. 7-8, 1982 p 377-386 (For primary document see N86-15893 06-51)
Avail: NTIS HC A04/MF A01

The effect of hypoxic conditions during irradiation of rats with 9.0 Gy dose of X-rays determined in lung homogenate concentration of DNA, protein and collagen and the activity of cathepsin, beta-glucuronidase, acid phosphatase and plasminogen activator was studied. It was found that regardless of hypoxic conditions of irradiation, collagen content in rat lungs was increased with time after exposure. Thypoxic conditions resulted in partial decrease during later periods after exposure to other biochemical indices of irradiation. It is evident in the case of the fibrinolytic activity which in hypoxic rats is increased during first several days while in rats irradiated under normal conditions this increase persist for more than 1 year after exposure. E.A.K.

N86-15895# Joint Publications Research Service, Arlington, Va.
TRITIUM INGESTION IN RATS
Zofia Pietrzak-Flis and Irena Radwan *In its* East Europe Report: Science and Technology (JPRS-ESA-85-031) 9 Oct. 1985 p 14-25 refs Transl. into ENGLISH from Nukeonika (Warsaw, Poland), v. 27, no. 7-8, 1982 p 389-403 (For primary document see N86-15893 06-51)
Avail: NTIS HC A04/MF A01

The effect of chronic ingestion of tritiated water and tritiated food on growth and reproduction of Wistar rats was evaluated. The animals were exposed during one or three successive generations. Ingestion of tritiated food caused higher reduction in sperm count than tritiated water. It is found that the effect of tritium on growth of rats and ability for sperm production depends on the absorbed dose and the form of ingested tritium. E.A.K.

N86-15896# Joint Publications Research Service, Arlington, Va.
ADVANCES IN OPTOELECTRONIC, NUCLEAR REACTOR, RADIOBIOLOGICAL RESEARCH: HIGH VOLTAGE OPTO-COUPLER **c35**
Jacek Stanislawski and Ewa Serebrankow *In its* East Europe Report: Science and Technology (JPRS-ESA-85-031) 9 Oct. 1985 p 26-36 refs Transl. into ENGLISH from Nukleonika (Warsaw, Poland), v. 27, no. 9-10, 1982 p 419-434 (For primary document see N86-15893 06-31)
Avail: NTIS HC A04/MF A01

The parameters of optocouples are discussed and the results of measurements of light emitting diodes (LED's) and photodiodes are shown. The scheme and characteristics of the fast high voltage optical isolator developed are presented. The obtained parameters are as follows: isolation voltage over 70 kB, t sub d--delay time is less than 50 ns, stability delta t sub d/delta I sub LED $<$ 0.5 ns/a with I sub LED $>$ 5a. E.A.K.

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N86-15897 Department of the Army, Washington, D. C.
ANTI-TRYPANOSOMAL ACTIVITY OF PLATINUM COORDINATION COMPOUNDS Patent
M. S. Wysor and L. A. Zwelling, inventors (to Army) Issued 30 Jul. 1985 4 p
(AD-D011860; US-Patent-4,532,122; US-Patent-Appl-SN-250991; US-Patent-Class-424-10) Avail: US Patent and Trademark Office CSCL 06/15

A novel method has been developed for improved chemotherapy of animals infected with African trypanosomiais. The method involves the concurrent administration of therapeutically effective amounts of cis-diamminedichloroplatinum (II) and bis-(diethylthiocarbamoyl)disulfide (disulfiram) or diethyl dithiocarbamate to the hydrated animal. Author (GRA)

N86-15898*# Stanford Univ., Calif. Dept. of Psychology.
COMPUTATIONAL MODELS OF HUMAN VISION WITH APPLICATIONS Final Report, Oct. 1985
Brian A. Wandell 12 Sep. 1985 7 p
(Contract NCC2-44)
(NASA-CR-176413; NAS 1.26:176413) Avail: NTIS HC A02/MF A01 CSCL 06P

Perceptual problems in aeronautics were studied. The mechanism by which color consistency is achieved in human vision was examined. A computable algorithm was developed to model the arrangement of retinal cones in spatial vision. The spatial frequency

spectra are similar to the spectra of actual cone mosaics. The Hartley transform as a tool of image processing was evaluated and it is suggested that it could be used in signal processing applications, GR image processing. E.A.K.

N86-15899# Desmatics, Inc., State College, Pa.
STATISTICAL RESEARCH ON PROBLEMS OF BIODYNAMICS Final Report
K. C. Burns, C. A. Mauro, and D. E. Smith Jul. 1985 23 p
(Contract N00014-79-C-0128)
(AD-A157993; TR-112-19) Avail: NTIS HC A02/MF A01 CSCL 06/19

The statistical research conducted focused on two major problem areas within the Navy's biodynamics program at NBDL. Those were: (1) impact acceleration injury, and (2) ship motion sickness. Additional research was conducted in the area of performance testing, which is relevant to both of the primary research topics. The following sections briefly summarize the research accomplished under this contract and provide a reference list of all technical reports (with abstracts), journal articles, and presentations resulting from this research effort. GRA

N86-15900# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE MIDDLE LATENCY RESPONSE (MLR) AND STEADY STATE EVOKED POTENTIAL (SSEP) IN NEONATES Ph.D. Thesis
R. C. Fifer May 1985 180 p
(AD-A158007; AFIT/CI/NR-85-100D) Avail: NTIS HC A09/MF A01 CSCL 06/16

This study evaluated the characteristics of the middle latency response (MLR) and the related steady state evoked potential (SSEP) in a total of 36 neonates. The reports of previous investigators have cast doubt on the existence of both the MLR and SSEP in neonates. The measurements in these studies were obtained, however, using stimulation and recording parameters that are appropriate for adults. Since virtually all other aspects of neonate audition differ significantly from comparable adult attributes, one goal of this study was to determine the appropriate parameters with which to obtain a valid MLR and SSEP in very young children. Other goals of this study included: (1) evaluation of two different algorithms for low-frequency sensitivity prediction using the SSEP; (2) investigation of the stability of the SSEP over repeated trials; and (3) elucidation of the relationship the neonatal MLR to later occurring auditory evoked potentials. GRA

N86-15901# Maryland Univ., College Park.
BINOCULAR IMAGE FLOWS: STEPS TOWARD STEREO - MOTION FUSION
A. M. Waxman and J. H. Duncan May 1985 60 p
(Contracts DAAK70-83-K-0018; DE-AC03-84ER-80189)
(AD-A158089; CAR-TR-119; CS-TR-1494) Avail: NTIS HC A04/MF A01 CSCL 06/16

In decomposing the visual information processing task into several stages, it is the intermediate level which is responsible for the recovery of surface shapes in a scene. It is often described as a set of shape from modules which, acting independently and in parallel, feed a viewer centered 2.5-D sketch of the visual field. Two of the most commonly studied and closely related modules are shape from stereo and shape from monocular motion. The analyses of visual data by stereo and motion modules have typically been treated as separate, parallel processes which both feed a common viewer-centered 2.5-D sketch of the scene. When acting separately, stereo and motion analyses are subject to certain inherent difficulties: (1) stereo must resolve a combinatorial correspondence problem and is further complicated by the presence of occluding boundaries; (2) motion analysis involves the solution of nonlinear equations and yields a 3-D interpretation specified up to an undetermined scale factor. This report describes a new module which unifies stereo and motion analysis in a manner in which each helps to overcome the other's shortcomings. One important result is a correlation between relative image flow (i.e., binocular difference flow) and stereo disparity; it points to the importance of the ratio delta/delta, rate of change of disparity delta to disparity delta, and its possible role in establishing stereo correspondence. Our formulation may reflect the human perception channel probed by Reagan and Beverley (1979). GRA

N86-15902# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
COMPARISON OF THE AIR FORCE FEMALE AND MALE PILOT GROUNDED TIME IN THE AIR FORCE MILITARY AIRLIFT COMMAND M.S. Thesis
J. A. Holl Jun. 1985 35 p
(AD-A158093; AFIT/CI/NR-85-64T) Avail: NTIS HC A03/MF A01 CSCL 05/9

The US Air Force presently has over 200 female pilots, and the numbers are steadily increasing. This thesis is the first step in determining the effect of female pilots on the Air Forces' flying squadrons' efficiency and effectiveness. This protocol will compare the average number of days per year men and women pilots are grounded for medical reasons. The duty not involving flying time or DNIF statistics will be used for the data. There are no known studies indicating there is a significant difference in male/female pilot medial absenteeism rates. If the female DNIF rate is found to be significantly larger than the males, it may indicate an effect on the squadrons readiness abilities. The Military Airlift Command (MAC) is chosen for sampling because a relatively large number of female pilots (96) are assigned to this command. The women will be compared to a representative sample of 288 male pilots also assigned to MAC. AF form 1041, which reports DNIF time to Command Headquarters, will be used to collect the DNIF days from the past year; age, rank, and marital status will also be collected. DNIF rates will be calculated correcting for person/months of observation. The age, rank, and marital status specific rates will also be compared. Author (GRA)

N86-15903# Army Environmental Hygiene Agency, Aberdeen Proving Ground, Md.
TOPICAL HAZARD EVALUATION PROGRAM OF CANDIDATE INSECT REPELLENT AI3-35770 HEXAHYDRO-1-((2-METHYLCYCLOHEXYL) CARBONYL)-1-H-AZEPINE Report, Aug. 1984 - Jun. 1985
R. D. Russell Jun. 1985 10 p
(AD-A158386; USAEHA-75-51-0435-85) Avail: NTIS HC A02/MF A01 CSCL 06/20

Topical Hazard Evaluations of USDA Candidate Insect Repellent AI3-35770 were performed using New Zealand White rabbits, albino Hartley guinea pigs, and Sprague Dawley rats. Chemical AI3-35770 produced moderate to severe primary dermal irritation and necrosis in rabbits and guinea pigs. These effects were quantitatively worse in rabbits than in guinea pigs. This compound was moderately toxic to rats when given by the oral route. GRA

N86-15904# Army Research Inst. of Environmental Medicine, Natick, Mass.
HUMAN THERMOREGULATORY RESPONSES TO COLD AIR ARE ALTERED BY REPEATED COLD WATER IMMERSION
A. J. Young, S. R. Muza, M. N. Sawka, R. R. Gonzalez, and K. B. Pandolf Aug. 1985 30 p
(DA Proj. 3E1-62777-A-879)
(AD-A158871; USARIEM-M38/85) Avail: NTIS HC A03/MF A01 CSCL 06/19

The effects of repeated cold water immersion on thermoregulatory responses to cold air were studied in seven males. A cold air stress test (CAST) was performed before and after completion of an acclimation program consisting of daily 90-min cold (18 C) water immersion, repeated five times a week for five consecutive weeks. The CAST consisted of resting 30 min in a comfortable (24 C, 30% rh) enviroment followed by 90 min in cold (5 C, 30% rh)air. Pre- and post-acclimation, metabolism (M) increased ($P < 0.01$) by 85% during the first 10 min of CAST, and thereafter rose slowly. After acclimation, M was lower ($P < 0.02$) at 10 min of CAST compared to before, but by 30 min M was the same. Therefore, shivering onset may have been delayed following acclimation. After acclimation, rectal temperature (T subscript re) was lower ($P < 0.01$) before and during CAST, and the drop in T subscript re during CAST was greater ($P < 0.01$) than before.

Mean weighted skin temperature (T subscript sk) was lower ($P < 0.01$) following acclimation than before, and acclimation resulted in a larger ($P < 0.02$) T subscript re to T subscript sk gradient. Plasma norepinephrine increased during both CAST ($P < 0.002$), but the increase was larger ($P < 0.004$) following acclimation. These findings suggest that repeated cold water immersion stimulates development of true cold acclimation in man, as opposed to habituation. The cold acclimation produced appears to be of the insulative type. GRA

N86-15905# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.

SOME EFFECTS OF ALCOHOL AND SIMULATED ALTITUDE ON COMPLEX PERFORMANCE SCORES AND BREATH ANALYZER READINGS

W. E. Collins, H. W. Mertens, and E. A. Higgins Jul. 1985 12 p (AD-A158925; DOT/FAA-AM-85-5) Avail: NTIS HC A02/MF A01 CSCL 06/15

This study assessed possible interactive effects of alcohol and a simulated altitude of 12,500 ft. Each of 17 men was trained on the various tasks that comprise the Multiple Task Performance Battery and then performed over a 2-week period in four experimental sessions, viz, ground level (1,300 ft), with and without alcohol, and altitude (12,500 ft), with and without alcohol. Subjects breathed appropriate gas mixtures through oxygen masks at both ground level and high altitude. Subjects performed for 3 hours in the afternoon. Alcohol doses were 2.2 mL of 100-proof vodka per kilogram of body weight mixed with three parts of a selected juice. Each 1-hour test block included five 10-minute performance periods with varying workloads and a 10-minute period for controlled breathanalyzer measurements. Results showed no differential effect of simulated altitude on breathanalyzer readings (peaks averaged .078% at 12,500 ft and .077% at ground level). The best performance occurred at ground level under placebo conditions; the 12,500-ft simulated altitude produced some decrement, for the placebo scores were depressed by altitude. Thus, there was no interactive effect of alcohol and altitude on either breathanalyzer readings or performance scores. However, the general decrement produced by altitude (with or without alcohol) serves to reduce further whatever margin of safety remains in performance skills following alcohol ingestion. Author (GRA)

N86-15906# Northwestern Univ., Evanston, Ill.

ENHANCING VISUAL SENSITIVITY Final Report, 1 Oct. 1983 - 30 Sep. 1984

R. Sekuler 24 May 1985 36 p
(Grant AF-AFOSR-0246-80)
(AD-A158799; AFOSR-85-0663TR) Avail: NTIS HC A03/MF A01 CSCL 05/10

This report summarizes the major studies carried out under AFOSR grant 80-0246 from October 1, 1983 through September 30, 1984. During this report period we did coordinated work on two aspects of motion perception. One work unit extended our earlier research on how training affects direction discrimination. These studies give new insights into the physiological locus and character of this particular form of perceptual learning. The second work unit exploited perceptual confusions among motion metamers in order to develop a quantitative model of the mechanisms that underlie human direction perception. The model is built around a small number ($n=12$) of broadly-tuned directionally-selective mechanisms. This model gives an excellent account of the experiments with motion metamers. Author (GRA)

N86-15907# Dalhousie Univ., Halifax (Nova Scotia).

VISUAL SENSITIVITIES AND DISCRIMINATIONS AND THEIR ROLES IN AVIATION Interim Technical Report, 1 Oct. 1983 - 30 Sep. 1984

D. Regan 17 Jun. 1985 44 p
(Grant AF-AFOSR-0030-84)
(AD-A158962; AFOSR-85-0639TR) Avail: NTIS HC A03/MF A01 CSCL 05/9

This report present four studies. An individual's ability to discriminate small differences in orientation about 5% and 0.5 deg respectively contrasts with the coarse size and orientation selectivity of neurons in the visual cortex of the brain. We report evidence that these fine discriminations are achieved by means of opponent processing: size discrimination is determined by antagonism between neurons that are coarsely selective for size, and orientation discrimination is mediated by neurons that are coarsely selective for orientation. Opponent processing implies that the neurons that determine detection are not the neurons that determine fine discrimination: we have experimentally verified that prediction. We have measured motion discrimination in pilots and attempted to predict flying performance in simulators and telemetry-tracked aircraft. Correlations between laboratory tests and flying performance were encouraging, and were much stronger than for simple visual sensitivities such as motion on contrast sensitivity. Some objects are invisible unless they move relative to the background, for example, a grassy hillock viewed against grass in nap of the earth helicopter flight. We have compared human visual sensitivity to such objects, with sensitivity to conventional objects defined by brightness difference. Spatial summation area, and temporal summation area are much larger for motion-defined objects than for brightness-defined objects. We report evidence that the Vector Analysis technique of mathematics may be relevant to the physiological study of visual cues in guided self-motion. GRA

N86-15908# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.

STOCHASTIC DIFFERENTIAL EQUATIONS FOR NEURONAL BEHAVIOR

S. K. Christensen and G. Kallianpur Jun. 1985 44 p
(Contract F49620-82-C-0009)
(AD-A159099; TR-103; AFOSR-85-0706TR) Avail: NTIS HC A03/MF A01 CSCL 06/16

This article extends the recent work of Kallianpur and Wolpert modeling the behavior of neurons by means of stochastic partial differential equations on the dual of a nuclear space. The extensions will cover nuclear spaces of a more general structure and will apply to models described in terms of more general differential operators. A second objective of this article is to present a theoretical framework which will include the model recently proposed and heuristically investigated by Wan and Tuckwell. The authors illustrate their approach and its application by giving a rigorous treatment of the Wan and Tuckwell model. But first they briefly describe the neurophysiological context. Author (GRA)

N86-15909# North Dakota State Univ., Fargo. Dept. of Electrical and Electronics Engineering.

APPLICATION OF THE SYSTEM IDENTIFICATION TECHNIQUE TO GOAL-DIRECTED SACCADES Final Report, May 1984 - May 1985

J. D. Enderle Jul. 1985 30 p
(Contract F49620-82-C-0035)
(AD-A159102; USAFSAM-TR-85-37) Avail: NTIS HC A03/MF A01 CSCL 06/16

System identification techniques were used to estimate muscle forces during horizontal saccadic eye movements in order to better understand the neuronal control strategy. The lateral and medial rectus muscle of each eye was modeled as a parallel combination of an active state tension generator with a viscosity and elastic element, connected to a series elastic element. The eyeball was modeled as a sphere connected to a viscosity and elastic element. The predictions of the model were shown to be in good agreement with the data. The results of extensive analysis did not support the existence of a postulated continuous-time external feedback control mechanism. Analysis of the data, however, did support a time optimal control strategy, a strategy which directs the eyeball to its destination in minimum time to saccades of all sizes. GRA

N86-15910# Naval Health Research Center, San Diego, Calif.

A COMPARISON OF THE EFFECTS OF CIRCUIT WEIGHT TRAINING ON MEN AND WOMEN Interim Report

E. J. Marcinik, J. A. Hodgdon, J. J. OBrien, and K. Mittleman

Jun. 1985 17 p
(M00-96-PN)
(AD-A159419; NAVHLTHRSCHC-85-13) Avail: NTIS HC A02/MF A01 CSCL 06/19

Prior to training, women exhibited 52.6% of male upper torso dynamic strength and 56.5% of male lower torso dynamic strength. Both sexes responded in a similar manner to the circuit weight training format. Dynamic muscular strength gains were 13.7% for men and 15.7% women. Stamina and all indices of relative body composition were unaffected by training. It can be concluded that circuit weight training demonstrates a potential for shipboard application. It results in the muscular strength gains shown to be necessary for shipboard work performance. It also helps to maintain aerobic fitness in a limited space environment. GRA

N86-15866# Joint Publications Research Service, Arlington, Va.
PROBLEMS OF STUDYING FLIGHT WORK IN SOVIET AVIATION MEDICINE OF THE 1920'S - 1930'S
V. M. Munipov *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 1-10 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 4-11 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

N86-15871# Joint Publications Research Service, Arlington, Va.
EFFECT OF LEVEL OF PHYSICAL ACTIVITY ON LIPID METABOLISM OF FLIGHT PERSONNEL
V. I. Libkind and V. D. Vlasov *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 40-43 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 29-31 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

N86-15872# Joint Publications Research Service, Arlington, Va.
OXYGENATION AND REGIONAL CIRCULATION IN GINGIVAL MUCOSAL TISSUES UNDER EFFECT OF HEAD-TO-PELVIS (+Gz) ACCELERATIONS
S. I. Volvach, Ye. A. Kovalenko, L. I. Voronin, N. V. Ulyatovskiy, V. K. Gabyshev, V. I. Nikiforov, and V. V. Arkhipov *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 44-49 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 31-35 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

N86-15873# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF SOME ASPECTS OF HUMAN AMINO ACID METABOLISM DURING 120-DAY ANTIORTHOSTATIC HYPOKINESIA
T. F. Vlasova, Ye. B. Miroshnikova, and A. S. Ushakov *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 50-53 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 35-38 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

N86-15874# Joint Publications Research Service, Arlington, Va.
EFFECT OF 7-DAY IMMERSION HYPOKINESIA ON CHARACTERISTICS OF PRECISION MOVEMENTS
L. S. Grigoryeva and I. B. Kozlovskaya *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 54-59 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 38-42 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

N86-15875# Joint Publications Research Service, Arlington, Va.
EFFECT OF DRY IMMERSION MODEL ON PARAMETERS OF FLUID-ELECTROLYTE METABOLISM, BLOOD PLASMA ALDOSTERONE AND CORTISOL LEVELS IN INDIVIDUALS DIFFERING IN BODY FLUID CONTENT
M. A. Yunusov, V. N. Orlov, and T. V. Vinokhodova *In its* USSR Report: Space Biology and Aerospace Medicine Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 60-64 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 42-45 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

N86-15879# Joint Publications Research Service, Arlington, Va.
MAN'S TOLERANCE TO FULMINANT FORM OF HYPOXIC HYPOXIA
A. Yu. Katkov, Ye. P. Vyazova, R. N. Chabdarova, I. S. Krikun, and Zh. M. Kudryashova *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 82-86 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 57-60 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

N86-15880# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF CATECHOLAMINE METABOLISM AT HIGH ALTITUDES
N. A. Davydova, Yu. A. Senkevich, M. B. Belakovskiy, and S. V. Samratova *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 87-91 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 60-63 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

N86-15887# Joint Publications Research Service, Arlington, Va.
INFORMATIVENESS OF ECHO SIGNAL IN PULSED ULTRASONOGRAPHY OF THE BRAIN (WITH USE OF MODEL)
L. G. Simonov, L. A. Rozenblyum, and N. N. Bogdanova *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 125-130 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 83-85 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

N86-15888# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF POSSIBILITY OF USING TWO-FREQUENCY IMPEDOMETRY FOR ESTIMATION OF PROPORTION OF TOTAL AND EXTRACELLULAR BODY FLUIDS
V. P. Krotov, Ye. G. Bazunova, and B. S. Kulayev *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 131-136 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 86-89 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

N86-15889# Joint Publications Research Service, Arlington, Va.
AUTOMATIC DETERMINATION OF CARDIAC OUTPUT FROM RHEOGRAM OF THE TRUNK
I. V. Sokolova and L. A. Khryashcheva *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 137-140 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 89-90 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

N86-15890# Joint Publications Research Service, Arlington, Va.
FUNCTIONAL STATE OF THE OLFACTORY ANALYZER IN A PRESSURIZED ENVIRONMENT
S. S. Pashin and G. I. Solomin *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 141-144 refs Transl. into

ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 90-92 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

N86-15891# Joint Publications Research Service, Arlington, Va.
GAS CHROMATOGRAPHIC ANALYSIS OF FREE FATTY ACIDS OF SKIN SURFACE LIPIDS
V. P. Maydina, B. L. Avetisyants, and D. M. Dubinin *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 145-148 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 93-94 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N86-15911# Toronto Univ. (Ontario).
A COMPUTER MODEL OF DRIVER RESPONSE
L. D. Reid, W. O. Graf, and I. A. Stoddard Sep. 1985 153 p ref Sponsored in part by General Motors and Ontario Ministry of Transportation and Communications
(UTIAS-293; ISSN-0082-5255) Avail: NTIS HC A08/MF A01

The development of a digital computer software package designed to allow the user to predict the dynamic computer software package designed to allow the user to predict the dynamic response of a driver/vehicle system to a limited number of roadway scenarios is described. The simulation is restricted to a single vehicle travelling at constant forward speed and does not cover complex multivehicle interactions. When a driving scenario is specified, the program selects a driver model. A simulation program is used to steer the vehicle through the maneuvers necessary to complete the driving task. In this manner records of steering wheel position and vehicle trajectory are generated. Three driving scenarios are included in the present development: (1) lane tracking along a straight roadway in the presence of disturbances; (2) lane tracking along a winding roadway; and (3) the obstacle avoidance maneuver. They are basically linear differential equations which mimic the driver's steering wheel response under the conditions which hold in each driving scenario. Each module in the analysis package is described. Author

N86-15912# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A COMPUTER MODEL OF CASE-BASED REASONING IN PROBLEM SOLVING: AN INVESTIGATION IN THE DOMAIN OF DISPUTE MEDIATION Ph.D. Thesis
R. L. Simpson, Jr. Jun. 1985 393 p
(AD-A158097; AFIT/CI/NR-85-81D) Avail: NTIS HC A17/MF A01 CSCL 05/10

Rather than approach each problem as a unique event, people often try to solve problems by recalling similar previous experiences as guides to problem solving. This analogical process, which we call case-based reasoning, seems to provide an explanation for the change in problem solving behavior of people over time. This research presents a computer process model of problem solving based on the use of case-based reasoning. The necessary reasoning processes, operational measures of similarity, and memory structures needed for effective storage and retrieval are presented via the specifications for an advisory system called the MEDIATOR, which offers advice on resolving common sense disputes. In this context, issues associated with enabling machines to dynamically adapt their reasoning and automatically recover from failure are discussed. The model of case-based problem solving which has been developed seems to offer promise as an integrated solution for some issues in problem solving, analogical reasoning, and machine learning. GRA

N86-15913# Georgia Inst. of Tech., Atlanta. Center for Man-Machine Systems Research.
ON LOOKING INTO THE BLACK BOX: PROSPECTS AND LIMITS IN THE SEARCH FOR MENTAL MODELS Technical Report, 1 Jun. 1982 - 31 May 1986
W. B. Rouse and N. M. Morris May 1985 81 p
(Contract N00014-82-K-0487)
(AD-A159080; GIT-TR-85-2) Avail: NTIS HC A05/MF A01 CSCL 05/10

The notion that humans have mental models of the systems with which they interact is a ubiquitous construct in many domains of study. This paper reviews the ways in which different domains define mental models, characterize the purposes of such models, and attempt to identify the forms, structures, and parameters of models. The resulting distinctions among domains are described in terms of two dimensions: (1) nature of model manipulation, and (2) level of behavioral discretion. A variety of salient issues emerge, including accessibility of mental models, forms and content of representation, nature of expertise, cue utilization, and, of most importance, instructional issues. Prospects for dealing with these issues are considered, as well as fundamental limits to identifying or capturing humans true mental models. GRA

N86-15914# Tennessee Univ., Knoxville.
A GENERAL MODEL FOR THE HOMOGENEOUS CASE OF THE CONTINUOUS RESPONSE Research Report
F. Samejima 31 Dec. 1983 125 p
(Contract N00014-81-C-0569; DA Proj. RR0-4204)
(AD-A159345; AD-F630701; RR-83-3-ONR) Avail: NTIS HC A06/MF A01 CSCL 12/1

A general model for the homogeneous case of the continuous response is proposed. The model is an expansion and generalization of the one proposed by the author in 1974, in which the open response situation is dealt with. In this generalized model, we deal with the closed response situation, and it includes the model for the open response situation as a special case. It also includes models for the open/closed and the closed/open response situations as two special cases. The distinction among the four response situations depends upon the probability assigned to each of the two extreme values of the continuous response, i.e., the probability zero corresponds to the word open, and non-zero to closed. Some examples are given. GRA

N86-15915# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hamburg (West Germany). Abteilung Flugphysiologie und Psychologie.
EXPERIENCE AND PERFORMANCE IN VIDEO GAMES AND ITS INFLUENCE ON APTITUDE TESTS IN AVIATION PSYCHOLOGY
Klaus-Martin Goeters and Bernd Lorenz Jul. 1985 47 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-85-43; ISSN-0171-1342) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 16.50

A method of evaluation of computer video games was used to analyze the relevance of video games for operational aptitude training in aviation psychology and their effects. A video game was used to test visual reaction under increased concentration strain, resistance to mental distraction, spatial orientation, and psychomotor coordination of air traffic controller applicants. Preexperience and performance with the game; preexperience and personality structure and interest; and the relationship between preexperience and performance tests were studied. Preexperience can influence performance with the game and the capacity structure. Preexperience with video games gives advantages to applicants in aviation psychology aptitude tests. Video games constitute a major psychomotor component in evaluation.
Author (ESA)

N86-15868# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF FACTORS DETERMINING PILOT'S GEOCENTRIC ORIENTATION
V. V. Lapa, Ye. Ye. Bukalov, and N. A. Lemeshchenko *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19,

No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 24-30 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 19-23 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

N86-15869# Joint Publications Research Service, Arlington, Va.
EFFECT OF THREAT STRESS ON PSYCHOMOTOR STABILITY OF PILOTS DIFFERING IN ANXIETY LEVEL
J. Terelak and J. Maciejczyk *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 31-34 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 24-26 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

N86-15870# Joint Publications Research Service, Arlington, Va.
USE OF FLIGHT SIMULATORS FOR DEMONSTRATION OF FUNCTIONAL CAPACITIES OF FLIGHT PERSONNEL
V. A. Bodrov, A. A. Kupriyanov, and V. V. Kharin *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 35-39 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 26-29 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

N86-15885# Joint Publications Research Service, Arlington, Va.
ONE ASPECT OF CREW TRAINING
Ye. D. Konovalov *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 114-119 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 77-80 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N86-15916# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
HUMAN FACTORS ENGINEERING DESIGN CRITERIA FOR FUTURE SYSTEMS. REPORT NUMBER 3: DESIGN CRITERIA EVOLVING FROM THE MULTIPLE MULTIPLE ROCKET SYSTEM (MLRS) OPERATIONAL TEST 3 Research Report, for Period Ending Apr. 1984
W. K. Earl and L. M. Crumley Jan. 1985 36 p
(AD-A158316; ARI-RP-85-05) Avail: NTIS HC A03/MF A01 CSCL 19/7

This document compares human factors engineering related problems identified in the U.S. Army Operational Test and Evaluation Agency MLRS Operational Test 3 with relevant criteria statements from MIL-HDBK-759A and MIL-STD-1472C. These criteria were reviewed to determine if they provided adequate guidance for making informed design judgements. Areas where existing criteria are inadequate or nonexistent were identified and new complete criteria developed. The new criteria are presented in a format designed to facilitate their use in the design of future similar systems. GRA

N86-15917# Naval Postgraduate School, Monterey, Calif.
MANAGING COMPUTER SYSTEMS DEVELOPMENT: UNDERSTANDING THE HUMAN AND TECHNOLOGICAL IMPERATIVES M.S. Thesis
G. S. Curtis Jun. 1985 154 p
(AD-A158976) Avail: NTIS HC A08/MF A01 CSCL 05/8

This thesis examines the human and technological issues that are often encountered during the development of modern computer information systems. People and technical constraints, including suggestions for minimizing negative consequences, are illustrated throughout the development life cycle. Special emphasis is placed on strategic planning, end user involvement in the requirements definition phase, and user-oriented software. The research consists of a review of current literature concerning techniques, methods and methodologies that are the basis for managing computer information system development. It is a collection of bits and pieces of wisdom by experts from all disciplines within the computer and managing fields. These techniques can be tailored to various scale projects having myriad objectives. The theory and practice of management methods included in this paper can be applied universally to computer projects. However, the study is directed at all U.S. Navy managers who are, or will be, involved in the transition to modern computer information systems. GRA

N86-15444# Joint Publications Research Service, Arlington, Va.
CNES OF FRANCE RESEARCHES REMOTE CONTROL SYSTEM FOR SPACE
Jean-Michel Guilbert *In its* West Europe Report: Science and Technology (JPRS-WST-85-015) 14 May 1985 p 1-4 Transl. into ENGLISH from Revue Generale de L'Electricite (Paris), Nov. 9814 p 724; 728-729 (For primary document see N86-15443 06-31)
Avail: NTIS HC A04/MF A01

N86-15867# Joint Publications Research Service, Arlington, Va.
SOME ASPECTS OF DETERMINING HUMAN PHYSICAL WORK CAPACITY UNDER HYPERBARIC CONDITIONS
L. A. Bryantseva and A. Ye. Mikhnenko *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 11-23 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 11-19 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

N86-15886# Joint Publications Research Service, Arlington, Va.
METHOD OF CALCULATING ANGULAR DIMENSIONS OF FLIGHT VEHICLE COCKPIT CANOPY CASINGS
A. V. Lekarev *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) 4 Nov. 1985 p 120-124 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 81-83 (For primary document see N86-15865 06-51)
Avail: NTIS HC A08

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N86-15918 Department of the Air Force, Washington, D.C.
VARIABLE RADIX PROCESSOR Patent
J. L. Burrows, inventor (to Air Force) Issued 9 Jul. 1985 13 p Supersedes AD-D010047
(AD-D011893; US-Patent-4,528,641; US-Patent-Appl-SN-442212; US-Patent-Class-364-757) Avail: US Patent and Trademark Office CSCL 09/2

A variable radix processor is constructed on 1.25 micrometer CMOS/SOS. The processor, based upon a predetermined algorithm, is constructed to process radix 2 to 7 data wherein the data is input in a parallel-by-word, parallel-by-bit format. A format selection switch has the data input whereafter a plurality of switches outputs an address format to a bit-slice multiply-adder. The bit slice multiply-adder has ROMs addressed by the format selection switch. Based upon the predetermined algorithm, each unique address format causes the ROMs to output a unique word in parallel bits to a tally cascade circuit and then to a fast-carry adder. The processor can operate on a transfer function such as ZA = + or - (A + or - C), ZB = B where A = sigma aiSi, B = biXi with very high throughput rates such as 380 million operations per second. Author (GRA)

N86-15919# Committee on Science and Technology (U. S. House).
COMPUTER SECURITY POLICIES
Washington GPO 1985 182 p refs Hearing before the Subcommittee on Transportation, Aviation and Materials of the Committee on Science and Technology, 99th Congr., 1st Sess., no. 26, 27 Jun. 1985
(GPO-52-154) Avail: Subcommittee on Transportation, Aviation and Materials

A congressional hearing was conducted and expert testimony heard on the subject of computer security policies. G.L.C.

N86-15920# Information Science Inst., Marina del Rey, Calif.
A RESEARCH PROGRAM IN COMPUTER TECHNOLOGY Annual Technical Report, Jul. 1983 - Jun. 1984
Apr. 1985 159 p
(Contracts F49620-84-C-0100; MDA903-81-C-0335; Grant NSF MCS-83-04190)
(AD-A157991; ISI/SR-85-150) Avail: NTIS HC A08/MF A01 CSCL 09/2

This research is focused on the development of computer science and technology, which is expected to have a high DOD/military impact. GRA

N86-15921# Florida Univ., Gainesville.
USE AND APPLICATION OF COMPUTERS IN CONSTRUCTION ESTIMATING M.S. Thesis
T. R. Huxel 1985 105 p
(Contract N66314-72-A-3029)
(AD-A158055) Avail: NTIS HC A06/MF A01 CSCL 09/2

The purpose of this thesis is to provide a general overview of construction estimating and an insight to computer-aided estimating. Increased knowledge about computerized estimating and confidence in the computer's potential use can result in providing more timely and accurate estimates. Although commputerized estimating is relatively new in the construction industry, its usage has been proven to be beneficial. The ability of the estimator to predict, as accurately as possible, the cost of construction today, correlates directly to the survival rate of a construction company. The thesis covers preliminary cost estimating and more detailed estimates, i.e., quantity surveys, lump sum and detailed unit cost estimates. The components of an estimate are reviewed and software are analyzed for the job of construction estimates. GRA

N86-15922# Army Military Personnel Center, Alexandria, Va.
A MODEL OF AN EXPERT COMPUTER VISION AND RECOGNITION FACILITY WITH APPLICATIONS OF A PROPORTION TECHNIQUE M.S. Thesis
G. E. Sherman 15 May 1985 109 p
(AD-A158073; AD-F630692) Avail: NTIS HC A06/MF A01 CSCL 09/2

In this thesis an expert vision system is proposed which infers, from the collection and evaluation of facial segments of a face, a set of possible identifies. Retrievals from a data store to accomplish this are facilitated by using the shape representations as keys to the records. The heuristic involves collecting the candidate identities in those sets by set intersection and a weighting scheme. Sensitivity and tolerance factors in this expert are adjustable in terms of range values. The value obtained during evaluation of a facial segment is accepted or tolerated relative to the range of values expected for that segment. A retrieval effects a subrange whose width is determined by sensitivity to be the center and some number of adjacent values above and below that center value. Expectation ranges can be tailored to incorporate system and environmental variables. GRA

N86-15923# Universal Energy Systems, Inc., Dayton, Ohio.
DEMONSTRATE CAPABILITIES OF DIGITAL GRAPHICS SYSTEM TO OBTAIN QUANTITATIVE INFORMATION FROM FLOW VISUALIZATION DATA Final Report, 1 Oct. 1984 - 31 May 1985
G. D. Streby 2 Jul. 1985 44 p
(Contract F33615-84-C-2481)
(AD-A158760; Rept-040-2-C; AFWAL-TR-85-2062) Avail: NTIS HC A03/MF A01 CSCL 09/2

The technical feasibility of using low cost digital graphics computer systems to obtain quantitative data from dynamic fluid simulations has been demonstrated. A computer graphic system is capable of capturing, digitizing, and color mapping of dynamic fluid flows. Such dynamic flow simulations are typical of test conditions found in a number of flow visualization test facilities. Using injected dye fluids, it is possible to visually determine the relative dye concentrations or dispersion characteristics within recirculation and mixing zones of a test configuration. The development of a complete dynamic fluid analysis system that includes a digital graphics system and basic image enhancement software would provide many engineering and design benefits to numerous simulation and flow visualization test facilities. A dynamic fluid analysis system could have great potential in commercial markets as an engineering or design tool in the areas of flow analysis, chemical processing, design of internal and external flow control devices, or as a teaching or training aid in fluid dynamics. GRA

N86-15924# Sparta, Inc., McLean, Va.
SPECIFIC RECOMMENDATIONS FOR IMPROVING NETWORK FEEDBACK TO HOSTS Final Report
22 Jun. 1985 81 p
(Contract DCA100-84-C-0085)
(AD-A158768; URW-5-DCA-039) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report provides recommendations for improving the feedback from the DDN network switching resources, IMPs, to their attached gateways/hosts so that the internetwork as a whole can function more efficiently and effectively. The report begins with a general description of the current internetworking environment. Problem areas in designing a efficient packet switching network or internetwork are identified along with potential improvements to current internetworking control mechanisms in the areas of flow control congestion control, type of service routing, uses of multipath routing and the impact/use of the new IMP end-to-end protocol. Emphasis is placed on the uses of the IMP end-to-end protocol to provide statistics about the network and on the DDN X.25 access protocol as the medium for passing this information to the gateways and hosts. Several approaches and techniques were identified which could improve the efficiency and effectiveness of the DoD internetwork and the DDN specifically. The main

information required by the hosts is readily available within the IMP, or at least will be available as the new IMP end to end protocol is introduced later this year. In order to develop new control algorithms, delay/capacity statistics need to be collected and analyzed. Network feedback mechanisms are proposed which would allow operational host/gateways to obtain the network delay/capacity parameters needed for optimal route selection, flow control, congestion control, etc. GRA

N86-15925# Stanford Univ., Calif. Dept. of Computer Science.
DATABASE THEORY Final Report, 15 Jun. 1980 - 1 Nov. 1984
J. D. Ulman 1 Feb. 1985 9 p
(Grant AF-AFOSR-0212-80)
(AD-A158975; AFOSR-85-0673TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

The research carried out under this grant from 1979 to 1984 centered around the design of universal relation data base systems. Certain theoretical aspects of dependency theory received attention, especially the theory of acyclic hypergraphs and their corresponding join dependencies. We investigated the use of first-order logic as a way to describe the effect of updates on universal-relation databases, and views in general. A number of other topics concerning data base systems also received attention, including concurrency control by locking, data coding for massive write-once memories, hash table designs, and logical interfaces for data base systems. GRA

N86-15926# Texas A&M Univ., College Station. Texas Transportation Inst.
A STUDY OF DATA ENTRY KEYBOARDS: THE 4 X 4 KEYPAD Final Report
R. J. Koppa Jun. 1985 52 p
(Contract DAAD05-83-M-H723)
(AD-A159095; HEL-TN-4-85) Avail: NTIS HC A04/MF A01 CSCL 09/2

Research concerning the layout of keypads for data entry was briefly surveyed to determine what conventions exist suitable for inclusion in MIL-STD-1280 (military standard on keyboard arrangements). The calculator layout (bottom-up) is preferable to the telephone layout (top-down). More research is needed to establish the best methods of denoting key mode selection. Industry conventions have dictated the location of function keys, but more research is necessary to verify these locations. Chord keyboards are an alternative, but they have specialized uses and are not recommended for low-skilled operators. GRA

N86-15927# Joint Publications Research Service, Arlington, Va.
USSR REPORT: CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY
27 Aug. 1985 167 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UCC-85-004) Avail: NTIS HC A08

The USSR Report on Cybnernetics, Computers and Automation Technology, 27 August 1985 (JPRS-UCC-85-004) contains articles on microprocessors, microelectronics, multiprocessing, parallel processing, computer software, numerical control, and computer networks. For individual titles, see N86-15928 through N86-15942.

N86-15928# Joint Publications Research Service, Arlington, Va.
RAISING THE RELIABILITY OF A REMOTE PROCESSING SYSTEM c62
V. Ye. Beloshevskiy *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 2-3 Transl. into ENGLISH from Avtomatike, Telemekhanika i Svyaz (Moscow), no. 3, Mar. 1985 p 34 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

To raise the reliability of the system created on the basis of the Y3SI035 computer, the Electronics Department of the Bilomission Railroad Computer Center has developed and introduced improvements in the devices and the procedures of working with them. First of all the Konsul-260.1 and Konsul-256 electromechanical typewriters were replaced with Videoton-340 and Videoton-52100.C video terminals. In order for the Videoton-340 to work with the YeSI035 computer, the circuit for recording the typewriter adapter and Videoton-340 codes had to be developed, and the control signals had to be matched. A special test bench was created for repeat testing and weeding out of failing 565RÚ1 memory microcircuits. The problem is that these microcircuits are very sensitive to temperature changes. When the processor fails, the system becomes uncontrollable. With introduction of redundancy, the consequences of failures may be minimized. But this immediately increases the system's cost, because all lines would have to be duplicated in the system, and an expensive processor would have to be placed in ready reserve. Getting round this problem is discussed. Author

N86-15929# Joint Publications Research Service, Arlington, Va.
PROCEDURES AND GENERAL METHOD FOR CHECKING MICROPROCESSOR MALFUNCTIONS ON THE BASIS OF PSEUDORANDOM TESTING SEQUENCES
K. G. Samofalov, Yu. S. Vilinskiy, and S. K. Ravnyago *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 9-15 refs Transl. into ENGLISH from Mekhanizatsiya i Avtomatizatsiya Upravleniya (Kiev), no. 1, Jan. - Mar. 1985 p 44-46 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

The method for checking malfunctions in BIS (large integrated circuit) microprocessors is based on using a determined flow of instructions containing pseudorandom operands representing a testing sequence and is formed by means of a tester based on a built-in pseudorandom code generator, which checks the microprocessor at its working frequency. This approach excludes the laborious stage of writing a test program and eliminates the need for storing microprocessor input units and output reactions in large memories. Moreover, use of pseudorandom testing sequences of considerable length (on the order of 100,000 to 1 million units) makes it possible to widen the class of malfunctions that are checked in a number of cases, and to avoid fault modeling, since probability methods can be used to assess the completeness of the check. Author

N86-15930# Joint Publications Research Service, Arlington, Va.
MICROELECTRONICS TECHNOLOGY c33
M. Sidorovyy *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 16-24 Transl. into ENGLISH from Znaniye-Sila (Moscow), no. 4, Apr. 1985 p 2-5 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

To develop at a leading pace the production of high-speed control and computational systems, peripheral equipment and software for these, electronic devices for control and telemechanics applications, a nation must have a strong microelectronics industry. The world of microelectronics created by man is one of fantastic possibilities and its horizons broaden daily. It is undergoing a process of interlocking growth and of introduction into our daily lives as well as into many fields of human endeavor. Microelectronics is a catalyst for technical progress. It provides artificial intelligence for robots and systems of robots, for automated systems used in control, teaching, design and computing applications, spacecraft and production facilities. A country's economic might and defensive capability are defined by the scale at which it produces pure and ultrapure substances and materials, including semiconductor and metallic crystals. Author

N86-15931# Joint Publications Research Service, Arlington, Va.
ORGANIZATION OF PROCESSOR ORIENTED TO MULTIPROCESSING c61
V. F. Guzik and V. N. Reshetnyak N its USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 25-33 refs Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Priborostroyeniye (Leningrad), no. 12, Dec. 1984 p 23-29 (For primary document see N86-15927

06-60)
Avail: NTIS HC A08

The structure of a functionally distributed processor is proposed, permitting organization of source program multiprocessing. The foundation of this structure is the concept of basic functional processor elements in the form of multiservice units. The approach presented here makes it possible to reduce time expenditures for blocking computational processes and to increase processor speed. The problem of increasing the capacity of modern computer systems is most urgent. Increasing the number of processors is not always expedient and justified. The overall speed of system Q sub s can be defined by the expression Q sub s = Q sub pr log sub 2 M, where M = number of processors in the system; Q sub pr = speed of one processor. On the other hand, reserves in increasing Q sub pr through increasing the speed of electronic processor components are, for all practical purposes, now exhausted. Therefore, the outlook for increasing Q sub pr (and subsequently Q sub s) must be linked to architectural solutions.
Author

N86-15932# Joint Publications Research Service, Arlington, Va.
MODELING PROBLEM-ORIENTED MULTIPROCESSOR SYSTEMS **c62**
V. A. Smolnikov *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 34-37 refs Transl. into ENGLISH from Mekhanizatsiya i Avtomatizatsiya Upravleniya (Kiev), no. 1, Jan. - Mar. 1985 p 37-39 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

The problem orientation of computer systems is associated as a rule with expansion and complication of the basic functions of general-purpose computers. The architectural features of problem-oriented computer complexes must maximally reflect the unique features of the algorithms of the class of tasks carried out by the given complex, and insure satisfaction of requirements imposed on its use. Typical of this class of problem-oriented computer complexes are the following features: use of multiprocessors; presence of a wide assortment of nonstandard input-output devices; orientation of the structure of the problem-oriented computer complex on processing homogeneous information and on a pipeline system of organizing calculations both at the micro- and at the macrolevel; presence of the necessary hardware for multiprogramming; the possibility of using the principal processor time for complex data processing with minimum system outlays but with sufficiently complex and diverse software components; presence of standard software developed specially for the given problem-oriented computer complex for the purposes of achieving the greatest effectiveness of the complex's operation. Author

N86-15933# Joint Publications Research Service, Arlington, Va.
MULTIPROCESSOR SYSTEMS WITH DYNAMIC REDISTRIBUTION OF REQUESTS THROUGH A COMMON BUS **c62**
V. A. Bogatyrev *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 38-43 refs Transl. into ENGLISH from Izvestiya Vysshigk Uchebnykh Zavedeniy: Priborostroyeniye (Leningrad), no. 3, Mar. 1985 p 33-38 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

An approach to the evaluation of the reliability of multiprocessor systems or dynamic distribution of requests with the use of partially efficient states of the processors and the limited capacity of the common bus is proposed. Modern modules of computing equipment and, particularly, microprocessors are multifunctional devices. Multifunctional modules, due to incomplete coincidence of circuits activated during the performance of various functions, can preserve their ability of realizing part of the functions after failures. Such states of multifunctional modules are called partially efficient. The use of partially efficient states of processors with dynamic distribution of requests opens additional possibilities of increasing the reliability of process control computer complexes. Author

N86-15934# Joint Publications Research Service, Arlington, Va.
USING DIGITAL SIMULATION IN THE DESIGN OF CAMAC SYSTEMS **c61**
P. V. Gamin, S. V. Morgunov, and M. A. Shamashov *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 44-47 refs Transl. into ENGLISH from Mekhanizatsiya i Avtomatizatsiya Upravleniya (Kiev), no. 1, Jan. - Mar. 1985 p 46-48 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

Today most information-measuring systems use program-controlled CAMAC standard bus-module systems as linking devices when designing automated scientific research systems (ASNI) and when performing bench tests. These stems do not provide developed resources for debugging the programs, which sharply reduces the effectiveness of the process of design and debugging programs directly by means of the control microcomputer contained within the composition of the information-measuring system. On the other hand the diversity of the experiments that are carried out generates the need for creating new specialized CAMAC standard devices. The problems that arise in this case include those of determining the internal logical organization of the devices, time synchronization, studying reactions to external controlling influences and acquiring reliable programs for servicing such devices. The methods of simulational modeling are enjoying wide use as a way to solve these problems. In particular, a simulational model of an information-measuring system consisting of an emulator with a full configuration based on a YeS computer has been proposed as a design tool for the hardware and software base of an information-measuring system. Author

N86-15935# Joint Publications Research Service, Arlington, Va.
WIDE-BAND SINGLE-BOARD ANALOG-DIGITAL CONVERTER
A. N. Kasperovich and Yu. V. Shalaginov *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 48-53 refs Transl. into ENGLISH from Avtometriya (Novosibirsk), no. 5, Sep. - Oct. 1984 p 108-112 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

The use of fast domestically built series 1107 large-scale integrated circuits (LSI) as parallel 6- and 8-bit analog-digital converters (ADC) has considerably broadened the possibilities for creating digital signal processing systems. However, the practical use of such devices requires the development and assembly on the circuit board of a buffer amplifier for the input signal (because of the need for rapid conversion of the large input volume by the ADC microcircuit), a reference voltage source (-2V) and a trigger pulse formation unit. It is noted that the TRW company which produces this type of microcircuits also produces functionally complete ADC which are complete on a single board where, along with the LSI ADC there is also the required auxiliary equipment.
Author

N86-15936# Joint Publications Research Service, Arlington, Va.
CYBERNETICS INSTITUTE DEVELOPS PARALLEL-PROCESSING COMPUTER
In its USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 54-55 Transl. into ENGLISH from Pravda (Moscow), 22 Feb. 1985 p 3 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

The development of a multiprocessor computer that operates on the parallel-processing principle is reported. The so-called macro-assembly-line principle of organizing computations as one way of realizing recursive computers was proposed several years ago. The concept uses the analog of a number of plants making assemblies and parts that go into an end product. A control system which ensures effective execution of operations under a task-sharing system is a macro-assembly-line computer. The work led to a success which has demonstrated the possibility of building computing systems which ensure growth in capacity practically directly proportional to the number of processors that are linked into the system. The computer which has been developed for this occupies a room only 14-15 square meters in area. For communicating with the computer, a language called MAYAK was devel-

oped; the letters are an acrynym which stands for macro-assembly-line language of computer programming. Together with a system of parallel programming and an on-line system, it makes it possible for extremely complex tasks which would take a year to accomplish by conventional means to be done in a matter of weeks or days. Author

N86-15937# Joint Publications Research Service, Arlington, Va.
PROGRAM BASE FOR RASTER DISPLAY c61
E. A. Talnykin *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 56-60 Transl. into ENGLISH from Avtometriya (Novosibirsk), no. 5, Sep. - Oct. 1984 p 104-107 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

The programming for the graphics display based on the Elektronika-60 microcomputer is discussed. The microcomputer controls the graphic controller and can have a communication link to another more fully equipped host computer. The only variants considered are those in which both computers have compatible architecture. The basis for the organization of the programming is the primitive graphic base module which generates graphic display for other program components. The module is always located in the microcomputer. If the application program which requires graphic possibilities is also located in the microprocessor then all the problems of intermodular action are solved at the editing level of the external links. Author

N86-15938# Joint Publications Research Service, Arlington, Va.
HIGH-SPEED RECEIVERS OF MICROPROCESSOR SIGNAL CONVERSION DEVICES
L. I. Sulin and V. V. Romanov *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 86-91 refs Transl. into ENGLISH from Mekhanizatsiya i Avtomatizatsiya Upravleniya (Kiev), no. 1, Jan. - Mar. 1985 p 55-57 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

The main effectiveness indicator of signal conversion devices intended for frequency-limited communication channels is the relative speed of data transmission, given certain limitations on the reliability of the received information. Raising the relative speed of data transmission requires use of combined modulation methods in combination with effective processing at the receiving end. As a rule this means an increase in the algorithmic complexity of the data processing. Growth in complexity of algorithms results in the need for developing complex specialized structures with rigid logical control, or synthesis of structures operating on the basis of microprogram control. The latter approach seems more preferable because use of LSI (large scale integration) microprocessor complexes that are series-produced by industry means that development time can be decreased, and the cost of the signal conversion devices is relatively low. On the other hand when a signal conversion device is built on the basis of microprocessor systems, the unique features of the microprocessor systems must be accounted for (in the selection or development of the signal conversion algorithms). Author

N86-15939# Joint Publications Research Service, Arlington, Va.
PROBLEMS OF DEVELOPING ALGORITHMIC DESIGN SYSTEM c61
O. M. Nabiyev and K. K. Zagidullin *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 92-96 refs Transl. into ENGLISH from Izvestiya Akademii Nauk Uzbekskoy SSR: Seriya Tekhnicheskikh Nauk (Tashkent), no. 6, Nov. - Dec. 1984 p 10-13 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

An algorithmic design system is intended for building systems which control design and support design execution. Research on possible ways of building such systems has shown the need of refining the concept of a complex system. The concept of a complex system is supplemented by the following principles: (1) a complex system (object in the real world) has properties of nonadditivity of characteristics. Nonadditivity of characteristics is understood in the sense of a system discontinuity of the second kind. For example, an optimal sector program is not the sum of optimal enterprise programs; (2) a complex system (object in the real world) has the property of substantial limitedness of resources. Substantial limitedness of resources is the prerequisite of a system discontinuity of the first kind consisting of a contradiction between the capabilities of various levels of control to store and process current information, on the one hand, and the requirements of optimality and efficiency, on the other. It follows from these principles that trying to build an algorithmic design system from the bottom up, i.e., first the individual banks and then the system as a whole, entails considerable difficulties in coordinating the interaction of the individual banks with each other. Author

N86-15940# Joint Publications Research Service, Arlington, Va.
FUNCTIONAL-LOGICAL SYSTEM FOR AUTOMATED PLANNING OF ROBOT PRODUCTION LINE CONTROL SYSTEMS c61
E. M. Pospelov and A. I. Savitskiy *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 103-107 refs Transl. into ENGLISH from Mekhanizatsiya i Avtomatizatsiya Upravleniya (Kiev), no. 1, Jan. - Mar. 1985 p 28-30 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

Combining automated design with the advantages of the methods for preparing and operating a flexible automatic production operation promotes a sharp rise in the effectiveness of design and production processes. As the object of design, a control system for a robot production line assembling printed boards is examined. This system provides for: assembly of printed boards with prescribed productivity and quality in accordance with the existing technology; and automatic adjustment of the robot production line to assemble one out of a prescribed set of types of printed boards while preserving the structure of the control system and the layout of the hardware complex of the robot production line. Use of the modular-hierarchical approach makes it possible to distinguish design of a robot production line, interpreted as a complex system, as a macrolevel consisting of a system of multilevel calculation macroprocedures. The flow chart for control system design is synthesized in the presence of uncertainties stemming from the modular-hierarchical approach itself. Author

N86-15941# Joint Publications Research Service, Arlington, Va.
AUTOMATED FLAW DETECTION INFORMATION-MEASURING SYSTEM
B. M. Berezyuk and Yu. M. Shumkov *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 108-112 refs Transl. into ENGLISH from Mekhanizatsiya i Automatizatsiya Upravleniya (Kiev), no. 1, Jan. - Mar. 1985 p 48-50 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

Now that the metrological characteristics of nondestructive control have improved, the following problems have become important: insuring high efficiency and reliability of such control, and providing for the processing of multiparametric flaw detection information in such a way as to permit separation of the parameters being checked; building a mathematical model of flaws in order to associate any law detection information received with the parameters of different types of flaws; providing for current display of flaw detection information in a form convenient to the operator; forming and storing a flaw detection log on checked articles and so on. One of the most promising ways of solving these problems integrally is to develop and create general-purpose flaw detection information-measuring systems based on highly productive computers making it possible to completely automate the acquisition, processing, display and storage of flaw detection information. Author

N86-15942# Joint Publications Research Service, Arlington, Va.
RED-GRAPHIC EDITOR IN PRINTED CIRCUIT BOARD DESIGN SYSTEM c61
E. A. Talnykin *In its* USSR Report: Cybernetics, Computers and

Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 113-118 refs Transl. into ENGLISH from Avtometriya (Novosibirsk), no. 5, Sep. - Oct. 1984 p 42-46 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

The main principles for a program for the design of printed circuit boards based on the Elektronika computer family or the SM-4 computer are given. The main component of the interactive system for graphic editing of printed circuit board topology is considered. The system works either on a computer with graphic peripherals connected by a link line, or on a microcomputer in an autonomous configuration. Author

N86-15943# Joint Publications Research Service, Arlington, Va.
USSR REPORT: CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY
19 Nov. 1985 56 p Transl. into ENGLISH from various Russian articles
(JPRS-UCC-85-009) Avail: NTIS HC A04

USSR Reports - Cybernetics, Computers, and Automation Technology, 19 November, 1985 (JPRS-UCC-85-009) contains reports on artificial intelligence, pattern recognition, robotics, holographic memory, and aircraft computer applications. For individual titles, see N86-15944 through N86-15947.

N86-15944# Joint Publications Research Service, Arlington, Va.
POSSIBILITY OF ARTIFICIAL INTELLIGENCE IN COMPUTERS **c63**
Yuriy Matveyev *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-009) 19 Nov. 1985 p 5-9 Transl. into ENGLISH from Nauka I Tekhnika (Riga, USSR), no. 7, Jul. 1985 p 16-17 (For primary document see N86-15943 06-60)
Avail: NTIS HC A04

A long path has been covered from the first computers to today's most powerful computer complexes--all in three decades. No other area of human activity has known such progress. Such basic parameters as a speed of hundreds of millions and billions of operations per second and memory capacities of hundreds of millions of bits are achievable for modern computer systems. The time is not far off when computers will achieve, at least in the quantitative sense, the complexity of the human brain (of course, complexity according to our present concepts). The concept artificial intelligence was born in cybernetics. It permits one to classify objects and to combine successfully a number of properties of computers and similar qualities of human intelligence. Systems based on computers that claim to have intelligence have been developed within the framework of cybernetics. One of them was developed at the Institute of Cybernetics, Ukrainian SSR Academy of Sciences, and can exchange questions and answers with a human at the level of a four or five-year old child; moreover, as the system communicates with people, teaching itself, it increases its intelligent capabilities. Author

N86-15945# Joint Publications Research Service, Arlington, Va.
BELORUSSIAN COMPUTER SPEAKS, READS GRAPHICS, X-RAYS
G. M. Novikov *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-009) 19 Nov. 1985 p 10-11 Transl. into ENGLISH from Sotsialisticheskaya Industriya (Moscow, USSR), 4 Apr. 1985 (For primary document see N86-15943 06-60)
Avail: NTIS HC A04

The information-management complex created at the Special Design-Engineering Bureau (SPTB) of Management Systems of the Belorussian SSR Ministry of Housing and Communal Services can solve the tasks of management of a branch, conduct an economic analysis and plan, hear, speak, see items of various forms and volumes, and read graphic information. Author

N86-15946# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL THEORY OF HOLOGRAPHIC MEMORY Abstract Only **c35**
M. V. Karasev and V. P. Maslov *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-009) 19 Nov. 1985 p 13 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), no. 5, 1985 p 1055-1058 (For primary document see N86-15943 06-60)
Avail: NTIS HC A04

Light waves are theoretically capable of recording octal information, based on the dimensionality of the set of bicharacteristic equations of Maxwell and their invariant vector measures. However, the impossibility of recording the amplitudes and phases of wave trains from actual light sources reduces this number to six. Holography allows all six signal parameters to be recorded on a two-dimensional surface and later reproduced. This statement is refined and is demonstrated mathematically. At points greater than a certain minimum distance from the surface of the hologram, the initial signal can be restored with accuracy equivalent to a certain complex factor and separated from the background for all orders of the short wave approximation. The amplitude, phase and polarization structure of the signal can take on any values. The reference wave is fixed, however. Complete restoration of signal polarization requires a known reference wave structure. Author

N86-15947# Joint Publications Research Service, Arlington, Va.
WORK ON PUTTING COMPUTER AND CRTS IN AIRLINER CONTROL PANELS **c06**
V. Tseyukov *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-009) 19 Nov. 1985 p 25-26 Transl. into ENGLISH from Vozdushnyy Transport (Moscow, USSR), 17 Aug. 1985 p 3 (For primary document see N86-15943 06-60)
Avail: NTIS HC A04

The controls of airplanes of the future will have far fewer electro-mechanical devices. Such devices and dozens of dials and lights will be replaced by the screen of a cathode-ray tube. The development of this kind of integrated information-signaling system is now in progress. With aviation technology advancing rapidly, aircraft systems are becoming more complex, and the most important ones have back-up systems. It is not easy for a pilot to control an aircraft and interact with instruments and devices. The new system will make it possible to remove a portion of the devices that are located directly in front of the pilot, and to remove all the devices from the flight engineer's panel. Needed information on the operation of all of the airplane's manitenance systems and several of its main units will be concentrated in a single place--on the color screens of cathode-ray tubes in the center of the instrument panel. Author

N86-15474# Joint Publications Research Service, Arlington, Va.
ROBOTRON HARDWARE COMPATIBLE PROGRAMMING LANGUAGES SURVEYED
W. Nyderle *In its* East Europe Report: Science and Technology (JPRS-ESA-85-033) 5 Nov. 1985 p 9-13 refs Transl. into ENGLISH from Neue Technik im Buero (East Berlin, East Germany), v. 29, no. 4, 1985 p 116-117 (For primary document see N86-15473 06-31)
Avail: NTIS HC A04/MF A01

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N86-15948# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
KBEmacs (KNOWLEDGE-BASED EDITOR IN emacs): A STEP TOWARD THE PROGRAMMER'S APPRENTICE
R. C. Waters May 1985 242 p
(Contract N00014-80-C-0505; Grants NSF MCS-79-12179; NSF MCS-81-17633)
(AD-A157814; AI-TR-753) Avail: NTIS HC A11/MF A01 CSCL

09/2

The Knowledge-Based Editor in Emacs (KBEmacs) is the current demonstration system implemented as part of the Programmer's Apprentice project. KBEmacs is capable of acting as a semi-expert assistant to a person who is writing a program-taking over some parts of the programming task. Using KBEmacs, it is possible to construct a program by issuing a series of high level commands. This series of commands can be as much as an order of magnitude shorter than the program it describes. KBEmacs is capable of operating on Ada and Lisp programs of realistic size and complexity. Although KBEmacs is neither fast enough nor robust enough to be considered a true prototype, both of these problems could be overcome if the system were to be reimplemented. Author (GRA)

N86-15949# Softech, Inc., Fairborn, Ohio.
Ada (TRADE NAME) COMPILER VALIDATION SUMMARY REPORT: RATIONAL ENVIRONMENT, VERSION A.2.0.6 FOR RATIONAL R1000 Final Report
24 May 1985 48 p
(Contract F33600-84-D-0280)
(AD-A157830) Avail: NTIS HC A03/MF A01 CSCL 09/2

The purpose of this Validation Summary Report is to present the results and conclusions of performing standardized tests on the Rational Environment. On-site testing was performed. The Rational Environment is hosted on the R1000 computer. The suite of tests known as the Ada Compiler Validation Capability (ACVC), Version 1.5, was used. The ACVC suite of tests is used to validate conformance of the compiler to ANSI/MIL-STD-1815A (ADA). The purpose of the testing is to ensure that the compiler properly implements legal language constructs and that it identifies, rejects from processing, and labels illegal language constructs. The testing also identifies implementation-dependent behavior permitted by the standard. These tests are designed to perform checks at compile time, during execution, and at link time. Results showed that all of the remaining 1797 valid tests were successfully passed by the Rational Environment. The AVF concluded that the results obtained show acceptable compliance to the January 1983 ANSI Ada Reference Manual. Author (GRA)

N86-15950# Syracuse Univ., N. Y.
THE LOGLISP PROGRAMMING SYSTEM Final Technical Report, Feb. 1981 - Feb. 1984
J. A. Robinson, E. E. Sibert, and K. J. Greene May 1985 129 p
(Contract F30602-81-C-0024)
(AD-A158011; RADC-TR-85-89) Avail: NTIS HC A07/MF A01 CSCL 09/2

LOGLISP is basically ZetaLisp with a logic programming system, LOGIC, embedded within it. LOGIC differs in a number of ways from the well-known PROLOG implementations of logic programming. The most noteworthy difference is that LOGIC is simply a set of new LISP primitive designed to be used freely within LISP programs. These primitives are invoked in the ordinary LISP manner by function calls from the terminal or from within other LISP programs. They return their results as LISP data objects which can be subject to analysis and manipulation. Each of the logical procedures comprising a LOGIC knowledge base is a LISP data object stored (like the definition of an ordinary LISP procedure) among the information concerning the identifier which is its name. Thus, one calls LOGIC from with LISP. It is also possible to call LISP from with LOGIC. The identifiers used as local predicate symbols, function symbols, and individual constants within a knowledge base or query can be given a LISP meaning by the ordinary LISP method of definition or assignment. Thus, every logic construct is capable of being interpreted as a LISP construct. During the deduction cycle of LOGIC each logic construct is evaluated as a LISP construct, according to a suitably generalized notion of evaluation, called LISP-reduction. The effect of this LISP-reduciton step within each deduction step is to make available to the LOGIC programmer virtually the full power of LISP. GRA

N86-15951# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
PRACTICAL GUIDELINES FOR TESTING Ada PROGRAMS M.S. Thesis
J. B. Snaufer May 1985 131 p
(AD-A158099; AFIT/CI/NR-85-58T) Avail: NTIS HC A07/MF A01 CSCL 09/2

Practical testing guidelines are given for Ada programs. This involves a general testing strategy supplemented with testing guidelines for specialized features. A general background of testing is given which covers testing objectives, testing steps, and current testing approaches for Pascal-like languages. Testing approaches for Pascal-like languages are given because Pascal is the base language for Ada. Ada is then analyzed from a testing point of view. Features are identified that are different from Pascal-like languages. The analysis includes a brief description of each feature and a description of errors/problems that might occur when using the feature. The analysis determines whether Pascal-like language structural testing approaches are adequate for the structural testing of each feature. If a new structural testing approach is needed for a feature, then testing guidelines are presented for that feature. A general testing strategy is then presented. The general testing strategy applies to Ada as a whole. The additional structural testing guidelines for certain features are to supplement the general testing strategy. Case studies are then given which demonstrate the general testing strategy and the supplemental guidelines. Each case study consists of a sample routine, sample test cases, and a step by step description of how to apply the supplemental guidelines to the sample routine. Finally, topics are given for future research. Author (GRA)

N86-15952# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
REPRESENTING TIME AND SPACE IN AN OBJECT ORIENTED HARDWARE DESCRIPTION LANGUAGE
M. R. Barbacci, G. Lindstrom, M. P. Maloney, and E. I. Organick 28 Jan. 1985 33 p
(Contracts F33615-81-K-1539; MDA903-81-C-0411)
(AD-A158226; CMU-CS-85-105) Avail: NTIS HC A03/MF A01 CSCL 09/3

Hardware description languages (HDLs) will clearly play a vital role in the comprehensive VLSI design tools of the future. Now that the requirements for such HDLs are becoming better understood it is becoming increasingly evident that the central issues are abstraction, modularity, and complexity management --- the same issues faced by designers of large scale software systems, rather than low-level technological details (although these must ultimately be served as well). Consequently, we argue that Ada, constituting the most advanced, carefully conceived, and (soon to be) widely available modern high-order programming language, forms not only an adequate but a compelling choice as an HDL. Specifically, Ada offers separate compilation as well as nesting of packages, tasks, and subprograms. These, and other important features of Ada, allow the construction of modular systems communicating through well defined interfaces. This paper demonstrates how placement and routing information can be incorporated into Ada hardware descriptions; another paper (Barbacci et al., 1985) shows how component and signal propagation delays over carriers are also incorporated into the same hardware descriptions. Author (GRA)

N86-15953# University of Southern California, Los Angeles. Dept. of Computer Science.
PROGRAMMING PRODUCTIVITY ENHANCEMENT BY THE USE OF APPLICATION GENERATORS BY THE USE OF APPLICATION GENERATORS Research Progress Report, 10 Jan. - 31 May 1985
E. Horowitz 22 Jun. 1985 15 p
(Grant AF-AFOSR-0232-82)
(AD-A158590; AFOSR-85-0618TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

The first chapter deals with the specific research areas that were investigated and discuss the accomplishments for each. The areas of research are: Application Generators; Office Information Systems; Software Engineering; and the Script Writer Software Development Environment. The next chapter reviews the progress

of all people who have been supported under the grant.
Author (GRA)

N86-15954# Mitre Corp., Bedford, Mass.
A DESIGN EVALUATION CHECKLIST FOR USER-SYSTEM INTERFACE SOFTWARE Final Report
S. L. Smith and J. N. Mosier Oct. 1984 66 p
(Contract F19628-84-C-0001)
(AD-A158599; MTR-9480; ESD-TR-84-358) Avail: NTIS HC A04/MF A01 CSCL 05/8

This report proposes a checklist for evaluating the design of user-system interface (USI) software. That checklist is based on recently published ESD/MITRE guidelines for USI software design, and can be used effectively only in conjunction with the source guidelines material. The checklist items cover six general functional areas of USI design: data entry, data display, sequence control, user guidance, data transmission, and data protection. For application to any particular system, the importance of each checklist item must be weighted in order to tailor the checklist to specific design requirements for USI software. This tailoring process should involve the joint efforts of system development managers, the software designers. and the intended system users. Once design requirements have been established in this way, then any proposed or implemented USI design can be evaluated in terms of its judged compliance with the specified checklist items. Overall estimates of design quality can be derived, along with more detailed analysis of design strengths and weaknesses, in order to recommend needed design improvements. This design evaluation checklist should prove a useful tool in Air Force system acquisition, As the USI design guidelines are revised and expanded, the checklist can be updated correspondingly. In the future, the checklist might be implemented to an on-line computer tool, with automated aids to facilitate its use. This report describes some of the potential computer aids that could be provided. GRA

N86-15955# Yale Univ. Observatory, New Haven, Conn. Dept. of Computer Science.
DYNAMIC MONOTONE PRIORITIES ON PLANAR SETS (EXTENDED ABSTRACT)
M. J. Fischer and M. S. Paterson Jul. 1985 8 p
(Contract N00014-82-K-0154)
(AD-A158610; YALEU/DCS/TR-415) Avail: NTIS HC A02/MF A01 CSCL 12/1

A monotonic priority set is a new data structure which supports maximum-finding and deletions over a set of weighted points in the plane. Global updates to the weights can also be made, incrementing the weights of all points above a given threshold in one of the coordinates. The weights are assumed to be always monotonic in both coordinates. An efficient implementation of this structure is presented and two main applications are described. The first is to the problem of optimal assembly of code for computers with two kinds of jump instruction: long and short. The task in the second application is the implementation of a queuing discipline based on the ranks with respect to two different criteria. GRA

N86-15956# Naval Postgraduate School, Monterey, Calif.
AN INTERACTIVE DISCRETE CONTROLS ANALYSIS OPTION (ORACLS) FOR THE CONTROLS ANALYSIS PACKAGE ON THE IBM 3033 M.S. Thesis
M. K. Brenny Jun. 1985 125 p
(AD-A158754) Avail: NTIS HC A06/MF A01 CSCL 09/2

This thesis discusses the implementation of a discrete control systems analysis option, ORACLS, for the CONTROLS analysis package. The option encompassses a collection of FORTRAN programs that facilitate the design and analysis of linear, multiple input/multiple output digital feedback control systems. All programs are interactive and operate in the VM/CMS environment of the IBM 3033. The main focus of this thesis was the development of the FORTRAN programs ORACLSX and TRANFUNC. These serve as the foundation of the ORACLS option, complimenting as well as interacting with those programs currently in use in the CONTROLS package. A collection of FORTRAN subroutines Optimal Regulator Algorithms for the Control of Linear Systems (ORACLS), by E.S. Armstrong of the NASA Langley Research Center, was used in the development of the ORACLSX program. Subroutines from the Optimal Systems Control FORTRAN program (OPTSYS), were used as the foundation for the discrete transfer function analysis program, TRANFUNC. The ORACLS option capabilities include: analog-to-digital matrix conversion, transfer function analysis, complete eigenvalue analysis, modal analysis, transient response calculation, Kalman-Bucy filter synthesis, and optimal regulator synthesis. Graphical results are available for the transient analysis and transfer function analysis portions. Author (GRA)

N86-15957# Washington Univ., Seattle. Dept. of Psychology.
PROBLEM SOLVING UNDER TIME-CONSTRAINTS
M. Richardson and E. Hunt 15 Aug. 1985 29 p
(Contract N00014-84-K-5553)
(AD-A158921; TR-10) Avail: NTIS HC A03/MF A01 CSCL 05/10

The computer science concept of production execution has been the basis of a large number of simulations of human problem solving. Typically these simulations have operated in a timeless environment, in the sense that they did not consider any constraints to solve problems quickly. In a previous technical report in this series Hunt and Lansman proposed an architecture for production-executing machines that could be applied to real-time problem solving. Hunt and Lansman supported their ideas by simulating data from laboratory studies drawn from the attention and performance field. In this paper Hunt and Lansman's approach is extended to the simulation of people doing a simple arithmetic task under considerable time pressure and when subject to interruptions. Data from the simulation is compared to data from college students doing the same task. GRA

N86-15958# Colorado School of Mines, Golden. Center for Wave Phenomena.
A PRELIMINARY REPORT ON SOME RECENT RESULTS IN BORN INVERSION
J. K. Cohen, F. G. Hagin, and N. Bleistein 26 Jun. 1985 25 p
(Contract N00014-84-K-0049)
(AD-A158926; CWP-031) Avail: NTIS HC A02/MF A01 CSCL 12/1

A research group at the Center for Wave Phenomena, Department of Mathematics, Colorado School of Mines, has been developing inversion algorithms for progressively more complex background velocities and source-receiver configurations. In each extension, the crucial issue has been the determination of certain properties of a matrix involving derivatives of the travel time(s). This report discusses and extends a recent result along these lines which appeared in a recent paper by Gregory Beylkin that reduces the problem to consideration of a single canonical determinant, h, and then assumes that this determinant does not vanish. With this assumption, he establishes a very general inversion result. Consequently, future theoretical research will focus on the evaluation of h, on establishing conditions for its non-vanishing and on dealing with the phenomena arising when it does vanish. Beylkin's paper uses powerful mathematical tools, such as the notions of pseudo-differential operators, generalized Radon transforms, and generalized back projections. Moreover, Beylkin frames his work in an N-dimensional space. Here, we dispense with much of this mathematical machinery and for convenience confine ourselves to the 3D case (and its 2.5D specialization). We are able to espound Beylkin's results by an approach similar to that presented earlier by Cohen and Hagin. However, we do not attempt to rigorously prove our results, but instead content ourselves with an intuitive derivation and the citing of Beylkin's main theorem. GRA

N86-15959# Cornell Univ., Ithaca, N.Y.
THE ISIS PROJECT: R AND D STATUS AND TECHNICAL REPORT Report, 4 May - 4 Aug. 1985
K. P. Birman 1985 14 p
(Contract MDA903-85-C-0124; ARPA Order 5378)
(AD-A158930) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report describes the accomplishments of the ISIS project during the six month period February - August 1985. As reported previously, a prototype version of the ISIS system was completed during the first three months of the project. This software transforms fault-intolerant single-site program specifications into fault-tolerant distributed implementations, and supervises execution of the resulting code. During the second three-month period, several aspects of the system have been enhanced: the interface between external programs and resilient objects, the language used to specify resilient objects, and the command language used to control the system. The academic staff designed and begun construction of a performance monitoring tool and some application software. Concurrency is the key to a good performance in a distributed system: the less synchronization employed by a system, the less frequently it will experience delays while waiting for inter-site message transmissions to complete. Recently a basic insight into the nature of concurrency in systems like ISIS was achieved. This has led to redesign of the ISIS communication primitives resulting in a communication subsystem that achieves very high levels of concurrency, but at the same time makes it easier to design high-level software that is correct in the presence of failures. The development of these primitives will probably prove to be the most important achievement of the six-month report period. By achieving high levels of concurrency while simultaneously simplifying concurrent algorithms, these represent a breakthrough in the methodology for developing of large, fault-tolerant systems. GRA

N86-15960# Naval Postgraduate School, Monterey, Calif.
IMPLEMENTATION OF A SERIAL DELAY INSERTION TYPE LOOP COMMUNICATION FOR A REAL TIME MULTITRANSPUTER SYSTEM M.S. Thesis
B. Evin Jun. 1985 91 p
(AD-A158980) Avail: NTIS HC A05/MF A01 CSCL 09/2

This thesis presents a design and implementation of a model of a multicluster loop interface. This Delay Insertion Loop type of interface is based on the IMS T424 Transputer and the Concurrent Sequential Processes type of programming language OCCAM. The Loop-type of communication systems are described and the Delay Insertion type of interface has been selected as the most appropriate one for high performance real-time applications. The OCCAM programming language, hosted on the VAX 11/780 VMS system (VAX-Virtual address extension, VMS-Virtual Memory System) was used to program the simulated version of the multicluster loop interface. GRA

N86-15961# Ballistic Research Labs., Aberdeen Proving Ground, Md.
COLOR POST-PROCESSOR FOR THE EPIC-2 COMPUTER PROGRAM Final Report
T. M. Sherrick Jun. 1985 30 p Original contains color illustrations
(DA Proj. 1L1-62618-AH-80)
(AD-A159321; BRL-SP-48) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report documents enhancements made to the EPIC=2 post-processor and the implementation of color into the post-processor. Reference 1 describes the EPIC-2 program and contains a user's manual for the program and post-processor. This report can be utilized as documentation for the original EPIC-2 post-processor, STPLOTPL, by merely neglecting the information pertaining to color graphics. Plotting information for the post-processor is written on two tapes by the EPIC-2 program at user-specified intervals. One tape contains all the flow field variables at preselected times. The other contains time histories of flow field variables at preselected times and locations. EPIC-2 is a two-dimensional computer program for impact and explosive detonation problems. The capability to treat spinning projectiles is also included. The numerical technique is based on a Lagrangian finite element formulation in which the equations of motion are integrated directly rather than through the traditional stiffness matrix approach. Trilinear material strength compressibility effects are included to account for elastic plastic flow and wave propagation. GRA

N86-15962# Naval Postgraduate School, Monterey, Calif.
RELATIONAL PROGRAMMING: DESIGN AND IMPLEMENTATION OF A PROTOTYPE INTERPRETER M.S. Thesis
J. R. Brown and S. G. Mitton Jun. 1985 228 p
(AD-A159404) Avail: NTIS HC A11/MF A01 CSCL 09/2

Relational programming is a methodology which combines the advantages of functional programming with the relatively simple laws which govern relations. The goal is to give the programmer an environment which allows a higher level of programming abstraction than currently exists, an easier approach to proving programs correct, and a language which can support new parallel architectures. In this thesis, the design and implementation of a prototype interactive interpreter for a relational programming language is presented. The reasoning behind the decision to use LISP as the implementation language is presented followed by an in depth discussion of the design issues involved and the implementation decisions made. How to use the interpreter and future research topics are discussed. Also several appendices are provided which include the grammar, the relational operators implemented, and the documented LISP code. GRA

N86-15963# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
THE REVISED REPORT ON SCHEME OR AN UNCOMMON LISP
H. Abelson, N. Adams, D. Bartley, G. Brooks, and W. Clinger, ed. Aug. 1985 77 p Sponsored in part by Indiana Univ.
(Contract N00014-80-C-050; Grants NSF NCS-83-04567; NSF 83-03325)
(AD-A159423; AI-M-848-Rev; Computer-Sci-Dept-TR-174) Avail: NTIS HC A05/MF A01 CSCL 09/2

Scheme is a statically scoped and properly tail-recursive dialect of the Lisp programming language invented by Guy Lewis, Steele Jr. and Gerald Jay Sussman. It was designed to have exceptionally clear and simple semantics and very few different methods of expression formation. This paper reports their unanimous recommendations augmented by committee work in the areas of arithmetic, characters, strings, and input/output. Scheme shares with Common Lisp the goal of a core language common to several implementations. Scheme differs from Common Lisp in its emphasis upon simplicity and function over compatibility with older dialects of Lisp. GRA

N86-15964# Naval Postgraduate School, Monterey, Calif.
THE DESIGN AND ANALYSIS OF A STYLIZED NATURAL GRAMMAR FOR AN OBJECT-ORIENTED LANGUAGE (OMEGA) M.S. Thesis
R. P. Ufford Jun. 1985 119 p
(AD-A159434) Avail: NTIS HC A06/MF A01 CSCL 09/2

In this thesis, we discuss the design issues of a stylized natural language syntax for Omega, an object-oriented programming language built upon rule-based pattern matching. Emphasis is placed on simplicity and flexibility in the design. The feasibility of the proposed grammar (Omega-1.5) is evaluated by developing a prototype translator to translate the Omega-1.5 grammar into the predicate logic style of Omega-1. Sample applications are provided to examine the features of the grammar and to explore possible application areas. Limitations in the design are analyzed and potential amelicriations are suggested. We conclude with a general assessment of the overall Omega system. Author (GRA)

N86-15965# Naval Postgraduate School, Monterey, Calif.
AN IMPLEMENTATION IN PASCAL: TRANSLATION OF PROLOG INTO PASCAL M.S. Thesis
A. Saraydin Jun. 1985 161 p
(AD-A159552) Avail: NTIS HC A08/MF A01 CSCL 09/2

This thesis tries to find a mapping algorithm between Prolog and Pascal languages. For this purpose, a small subset of Prolog is chosen and translated into Pascal code. Also, the concept of logic programming and its practical application in the programming

language Prolog, are discussed. The reader is expected to be familiar with Pascal and Prolog. Author (GRA)

N86-15966# RAND Corp., Santa Monica, Calif.
RUNNING ROSS IN AN EMACS ENVIRONMENT
D. J. McArthur Apr. 1985 13 p
(AD-A159567; RAND/P-7088) Avail: NTIS HC A02/MF A01 CSCL 09/2

This paper describes a software environment in which to run ROSS, an object-oriented simulation language. The goal of the facility is to provide the user with tools that can increase the speed at which the user creates, tests and debugs large ROSS systems. Using ROSS alone, making permanent fixes to code was tedious. The user had to get out of ROSS, into and editor, make the changes, return to ROSS, then re-load the changed file. The approach is to embed ROSS inside Emacs, a powerful, personalizable, screen-oriented, to editor. Emacs was tailored to provide just the tools the ROSS programmer needs. For example, the user never has to leave ROSS to make code changes, and all the lower-level details of code management-such as finding the file (and location in the file) of behaviors or functions, saving permanent changes onto disk, and loading new definitions back into ROSS-are done automatically. This facility makes ROSS a much more friendly and powerful environment for debugging. This paper describe various facets of the ROSS-EMACS facility. It begins with a brief overview, followed by descriptions of commands for editing functions and behaviors, managing Emacs windows, evaluating Lisp forms, compiling Lisp forms, and defining ROSS systems. Each section starts with a brief description, followed by a list of the Emacs commands that implement the described capabilities. GRA

N86-15967# Los Alamos National Lab., N. Mex.
CAT: AN INTERACTIVE GRAPHICS CODE
K. S. Holian May 1985 63 p
(Contract W-7405-eng-36)
(DE85-016212; LA-10416-MS) Avail: NTIS HC A04/MF A01

CAT is an interactive graphics code available on the Cray machine. In addition to plotting, it can manipulate data in many ways, including performing arithmetic operations, rearranging data, and interpolating. This manual instructs in the use of CAT. DOE

N86-15968# Lawrence Livermore National Lab., Calif.
APPLICATION AND IMPLEMENTATION OF TRANSIENT ALGORITHMS IN COMPUTER PROGRAMS
D. J. Benson Jul. 1985 19 p Presented at the Computational Structural Mechanics and Dynamics Workshop, Hampton, Virginia, 17 Jun. 1985
(Contract W-7405-eng-48)
(DE85-015396; UCRL-92985; CONF-8506160-1) Avail: NTIS HC A02/MF A01

This presentation gives a brief introduction to the nonlinear finite element programs developed at Lawrence Livermore National Laboratory by the Methods Development Group in the Mechanical Engineering Department. The four programs are DYNA3D and DYNA2D, which are explicit hydrocodes, and NIKE3D and NIKE2D, which are implicit programs. The presentation concentrates on DYNA3D with asides about the other programs. During the past year several new features were added to DYNA3D, and major improvements were made in the computational efficiency of the shell and beam elements. Most of these new features and improvements will eventually make their way into the other programs. The emphasis in our computational mechanics effort has always been, and continues to be, efficiency. To get the most out of our supercomputers, all Crays, we have vectorized the programs as much as possible. Several of the more interesting capabilities of DYNA3D will be described and their impact on efficiency will be discussed. Some of the recent work on NIKE3D and NIKE2D will also be presented. In the belief that a single example is worth a thousand equations, we are skipping the theory entirely and going directly to the examples. DOE

N86-15969# Mound Lab., Miamisburg, Ohio.
OPERATIONAL METHODS FOR DATA INTERPOLATION
G. L. Silver 1 Aug. 1985 37 p
(Contract DE-AC04-76DP-00053)
(DE85-016050; MLM-3277) Avail: NTIS HC A03/MF A01

The operational method for data treatment is illustrated: four, five, six, and seven point echo functions, formulas for extremum evaluation and location, two-dimensional echo functions, equations relating data in two-dimensional configurations, derivative methods, and programs are given. DOE

N86-15970# California Univ., Santa Barbara. Dept. of Electrical and Computer Engineering.
ALGORITHMS AND SOFTWARE FOR POLE ASSIGNMENT AND OBSERVERS, REVISION 1
A. J. Laub and M. Wette 15 May 1985 91 p
(Contract W-7405-eng-48)
(DE85-016068; UCRL-15646-Rev-1) Avail: NTIS HC A05/MF A01

This is a final report for a project 6 entitled Algorithms and software for pole assignment and Observers for Dr. Charles J. Herget of Lawrence Livermore National Laboratory. The work consisted of evaluating some algorithms and software for pole placement and producing some software for full-order observers. Several promising pole placement approaches were tried and extensive numerical testing was done. This is documented in detail later in the report. A suite of programs to implement full-order observer design, as well as stand-alone pole placement software, has been written and documented and is also described in detail in the sequel. Both single-input and multi-input pole placement were investigated with considerable effert being devoted to writing code for the latter for which no reliable codes were already available. Time did not permit writing and testing of code to do minimal order observers buth such a project look feasible and may be undertaken independently by the authors. DOE

N86-15971# Sandia Labs., Albuquerque, N. Mex.
DAASY (DATA ACQUISITION AND ANALYSIS SYSTEM)
G. J. Hansen and M. J. Boyer Jul. 1985 103 p
(Contract DE-AC04-76DP-00789)
(DE85-016341; SAND-85-1140) Avail: NTIS HC A06/MF A01

This report describes a data acquisition and analysis system (DAASY) which is capable of digitizing up to 80 analog inputs to 12 bits plus parity and storing the converted data in a memory system. In direct support of DAASY is instrumentation trailer B-70. This trailer houses the necessary hardware and software to ask for and receive the data stored in DAASY's memory. These data are processed in the PDP-11 computers in B-70 where calculations are made to produce data plots in engineering units. Both the DAASY and B-70 are compatible with the Nevada Test Site (NTS) range timing system, signal system, and control system. DOE

N86-15972# Sandia National Labs., Albuquerque, N. Mex.
PETROS: A PROGAM FOR CALCULATING TRANSPORT OF HEAT, WATER, WATER VAPOR AND AIR THROUGH A POROUS MATERIAL
G. R. Hadley May 1985 68 p refs
(Contract DE-AC04-76DP-00789)
(DE85-013168; SAND-84-0878) Avail: NTIS HC A04/MF A01

The one-dimensional code PETROS computes the transport of water, water vapor, an inert gas, and heat through a partially saturated porous medium. The mass flux of liquid water is driven by gradients in saturation, temperature, and gas pressure as well as the force of gravity. Gas transport includes effects due to Knudsen diffusion and binary gaseous diffusion of each gas component, plus Darcy flow of he gas mixture. Evaporation and condensation are accounted for, both in the fluid mass balance and the heat equation. A description is given of the model assumptions and the resulting equations, together with the numerical techniques used to obtain problem solutions. Included also are instructions for running the code, and a sample problem. DOE

N86-15973# Oak Ridge Y-12 Plant, Tenn.
COMPUTER-ASSISTED PROGRAM DESIGN

K. G. Young 27 Jun. 1985 27 p refs
(Contract DE-AC05-84OR-21400)
(DE85-015315; Y-2351) Avail: NTIS HC A03/MF A01

An automated interactive specification technique that has a mathematical basis is discussed. Two sample applications, a hypothetical environmental monitoring system and data management in an industrial environment, are presented. To give a realistic understanding of this new technique, alternative methods of software specification are discussed. This new technique appears to be particularly suited for large complex systems. DOE

N86-15974# Argonne National Lab., Ill.
PERFORMANCE OF VARIOUS COMPUTERS USING STANDARD LINEAR EQUATIONS SOFTWARE IN A FORTRAN ENVIRONMENT
J. J. Dongarra 15 Jul. 1985 12 p
(Contract W-31-109-ent-38)
(DE85-015338; ANL/MCS-TM-23) Avail: NTIS HC A02/MF A01

This note compares the performance of different computer systems while solving dense systems of linear equations using the LINPACK software in a FORTRAN environment. About 100 computers, ranging from a CRAY X-MP to the 68,000 based systems such as the Apollo and SUN Workstations to IBM PC's, are compared. DOE

N86-15975# Lawrence Livermore National Lab., Calif.
DATA FLOW GRAPH OPTIMIZATION IN IF1
S. Skedzielewski and M. Welcome 7 Feb. 1985 23 p Presented at the Functional Programming Languages and Computer Architecture Conference, Nancy, France, 16 Aug. 1985
(Contract W-7405-eng-48)
(DE85-007979; UCRL-92122; CONF-850854-1) Avail: NTIS HC A02/MF A01

Optimization techniques are as important when compiling data flow languages as when compiling conventional languages. This paper describes work that has been done on optimizers for SISAL programs that have been translated into IF1 data flow graphs. It shows that conventional optimization algorithms are extremely cheap to implement for data flow graphs, and that the payoff for even simple optimizations can be large. DOE

N86-15426# Hokkaido Univ., Sapporo (Japan).
ON THE ASSIGNMENT ALGORITHM BY MEANS OF MULTI-LINKED DATA STRUCTURE
Tsutomu Da-Te and Hidetoshi Nonaka *In* the Bulletin of the Faculty of Engineering, Hokkaido Univ., No. 128 Oct. 1985 61 p In JAPANESE; ENGLISH summary (For primary document see N86-15420 06-31)
Avail: NTIS HC A06/MF A01

N86-15479# Joint Publications Research Service, Arlington, Va.
MC68000 MONITOR PROGRAM DISASSEMBLED
Yuan Hongchun *In its* China Report: Science and Technology (JPRS-CST-85-040) 20 Nov. 1985 p 6-18 Transl. into ENGLISH from Weixing Jisuanji (Chongqing, China), no. 2, 14 Mar. 1985 p 102-107 (For primary document see N86-15478 06-31)
Avail: NTIS HC A06/MF A01

N86-15480# Joint Publications Research Service, Arlington, Va.
MICROPROCESSOR APPLICATION IN ERROR CODE CORRECTION
Zhou Dahua and Liu Yuqin *In its* China Report: Science and Technology (JPRS-CST-85-040) 20 Nov. 1985 p 19-32 refs Transl. into ENGLISH from Dianzi Kexue Jishu (Beijing, China), v. 15, 10 Feb. 1985 p 2-8 (For primary document see N86-15478 06-31)
Avail: NTIS HC A06/MF A01

N86-15931# Joint Publications Research Service, Arlington, Va.
ORGANIZATION OF PROCESSOR ORIENTED TO MULTIPROCESSING
V. F. Guzik and V. N. Reshetnyak N its USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 25-33 refs Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Priborostroyeniye (Leningrad), no. 12, Dec. 1984 p 23-29 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

N86-15934# Joint Publications Research Service, Arlington, Va.
USING DIGITAL SIMULATION IN THE DESIGN OF CAMAC SYSTEMS
P. V. Gamin, S. V. Morgunov, and M. A. Shamashov *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 44-47 refs Transl. into ENGLISH from Mekhanizatsiya i Avtomatizatsiya Upravleniya (Kiev), no. 1, Jan. - Mar. 1985 p 46-48 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

N86-15937# Joint Publications Research Service, Arlington, Va.
PROGRAM BASE FOR RASTER DISPLAY
E. A. Talnykin *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 56-60 Transl. into ENGLISH from Avtometriya (Novosibirsk), no. 5, Sep. - Oct. 1984 p 104-107 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

N86-15939# Joint Publications Research Service, Arlington, Va.
PROBLEMS OF DEVELOPING ALGORITHMIC DESIGN SYSTEM
O. M. Nabiyev and K. K. Zagidullin *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 92-96 refs Transl. into ENGLISH from Izvestiya Akademii Nauk Uzbekskoy SSR: Seriya Tekhnicheskikh Nauk (Tashkent), no. 6, Nov. - Dec. 1984 p 10-13 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

N86-15940# Joint Publications Research Service, Arlington, Va.
FUNCTIONAL-LOGICAL SYSTEM FOR AUTOMATED PLANNING OF ROBOT PRODUCTION LINE CONTROL SYSTEMS
E. M. Pospelov and A. I. Savitskiy *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 103-107 refs Transl. into ENGLISH from Mekhanizatsiya i Avtomatizatsiya Upravleniya (Kiev), no. 1, Jan. - Mar. 1985 p 28-30 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

N86-15942# Joint Publications Research Service, Arlington, Va.
RED-GRAPHIC EDITOR IN PRINTED CIRCUIT BOARD DESIGN SYSTEM
E. A. Talnykin *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 113-118 refs Transl. into ENGLISH from Avtometriya (Novosibirsk), no. 5, Sep. - Oct. 1984 p 42-46 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

62 COMPUTER SYSTEMS

Includes computer networks.

N86-15976# Polytechnic of Central London (England). Dept. of Library Services.
MICROCOMPUTER NETWORKING IN LIBRARIES. REPORT OF A STUDY VISIT TO THE UNITED STATES 14TH OCTOBER 1983
Mel Collier 1984 18 p
(BLRDR-5819) Copyright. Avail: Issuing Activity

A study visit made to the United States of America by M.W. Collier is reported. The aim of the visit was to gather information on local area network developments in the U.S. Information was gathered on network developments in libraries. A presentation at a conference in Colorado Springs was made on microcomputer networking in libraries. The visit is outlined in detail. Author

N86-15928# Joint Publications Research Service, Arlington, Va.
RAISING THE RELIABILITY OF A REMOTE PROCESSING SYSTEM
V. Ye. Beloshevskiy *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 2-3 Transl. into ENGLISH from Avtomatike, Telemekhanika i Svyaz (Moscow), no. 3, Mar. 1985 p 34 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

N86-15932# Joint Publications Research Service, Arlington, Va.
MODELING PROBLEM-ORIENTED MULTIPROCESSOR SYSTEMS
V. A. Smolnikov *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 34-37 refs Transl. into ENGLISH from Mekhanizatsiya i Avtomatizatsiya Upravleniya (Kiev), no. 1, Jan. - Mar. 1985 p 37-39 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

N86-15933# Joint Publications Research Service, Arlington, Va.
MULTIPROCESSOR SYSTEMS WITH DYNAMIC REDISTRIBUTION OF REQUESTS THROUGH A COMMON BUS
V. A. Bogatyrev *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-004) 27 Aug. 1985 p 38-43 refs Transl. into ENGLISH from Izvestiya Vysshigk Uchebnykh Zavedeniy: Priborostroyeniye (Leningrad), no. 3, Mar. 1985 p 33-38 (For primary document see N86-15927 06-60)
Avail: NTIS HC A08

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N86-15977 CIAD, Zoetermeer (Netherlands). Projectgroep.
EXPERT SYSTEMS IN ENGINEERING PRACTICE Final Report [EXPERTISYSTEMEN IN DE INGENIEURSPRAKTIJK]
Jun. 1985 201 p refs Partly in DUTCH and ENGLISH
(ISBN-90-6818-018-5) Copyright. Avail: Issuing Activity

The usefulness of artificial intelligence and particularly expert systems for computer aided design support, was investigated. The DELFI expert system was tested. Using the results of this test, DELFI was redesigned, providing possibilities of iteration, calling external calculation routines, initialization of fixed data into a base, and graphical reproduction. Design rules are framed as input for the DELFI program. A design process is made, to investigate phases and operations in which an expert system is useful.
Author (ESA)

N86-15978# Yale Univ., New Haven, Conn. Dept. of Computer Science.
DISTRIBUTED FIFO ALLOCATION OF IDENTICAL RESOURCES USING SMALL SHARED SPACE
M. J. Fischer, N. A. Lynch, J. E. Burns, and A. Borodin Jun. 1985 40 p
(Contracts N00014-82-K-0154; DAAG29-79-C-0155; Grants NSF MCS-77-02474; NSF MCS-77-15628)
(AD-A159151; Yaleu/DCS/TR-421) Avail: NTIS HC A03/MF A01 CSCL 09/2

This document presents a simple and efficient algorithm for the FIFO allocation of k identical resources among asynchronous processes which communicate via shared memory. The algorithm simulates a shared queue but uses exponentially fewer shared memory values, resulting in practical savings of time and space as well as program complexity. The algorithm is robust against processes failure through unannounced stopping, making it attractive also for use in an environment of processes of widely differing speeds. In addition to its practical advantages the authors show the algorithm is optimal (to within a constant factor) with respect to shared space complexity. GRA

N86-15979# Oak Ridge National Lab., Tenn.
HYPERCUBE CONCURRENT COMPUTATION AND VIRTUAL TIME FOR ROBOTIC APPLICATION
J. Barhen 1985 31 p Presented at the International Conference on Robotics Research, St. Louis, Mo., 25 Mar. 1985
(Contract DE-AC05-84OR-21400)
(DE85-009479; CONF-8503154-1) Avail: NTIS HC A03/MF A01

The programmatic activities of CESAR, the Center for Engineering Systems Advanced Research, are briefly reviewed. In the concurrent computation area, critical issues related to the control of intelligent machines using hypercube ensembles are outlined. The mapping of task graphs exhibiting structural irregularity and nonlocal communication patterns is discussed and the results of an application to the solution of robot inverse dynamcs are given. Finally, the design of a Virtual Time Intelligent Machine Operating System (IMOS/VT) for the ORNL/NCube ensemble computer is presented. DOE

N86-15980# Sheffield Univ. (England). Dept. of Control Engineering.
ON THE OPTIMAL CONTROL OF BILINEAR SYSTEMS AND ITS RELATION TO LIE ALGEBRAS
S. P. Banks and M. K. Yew 1985 14 p refs
(RR-275) Avail: NTIS HC A02/MF A01

The minimum fuel problem for a bilinear system is considered. It is shown how to obtain the optimal control by considering the Lie algebra generated by the system matrices. It is noted that an open-loop control depending on the initial value of the state x sub 0 is obtained. However, using the principle of receding horizon control, the control can be applied as if it were always starting at an optimizing interval of T seconds; x sub 0 can be replaced by x(t) and T allowed to depend on the state to obtain a nonlinear feedback control. The details are the same as with linear systems. Author (ESA)

N86-15981# Sheffield Univ. (England). Dept. of Control Engineering.
ON THE OPTIMAL CONTROL OF NONLINEAR SYSTEMS
S. P. Banks 1985 11 p refs
(RR-278) Avail: NTIS HC A02/MF A01

The optimal control of a nonlinear analytic system is approached by writing the system in the form of an infinite-dimensional bilinear system. The theory of tensors is used, and the Lie algebra of tensors generated by the operators in the associated bilinear system is considered. This simplifies considerably the approach where a power series in the tensor operators is obtained for the optimal control. It is shown that particularly simple results hold if the Lie algebra is nilpotent. Author (ESA)

N86-15944# Joint Publications Research Service, Arlington, Va.
POSSIBILITY OF ARTIFICIAL INTELLIGENCE IN COMPUTERS
Yuriy Matveyev *In its* USSR Report: Cybernetics, Computers and Automation Technology (JPRS-UCC-85-009) 19 Nov. 1985 p 5-9 Transl. into ENGLISH from Nauka I Tekhnika (Riga, USSR), no. 7, Jul. 1985 p 16-17 (For primary document see N86-15943 06-60)
Avail: NTIS HC A04

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N86-15982 Ruhr Univ., Bochum (West Germany). Inst. fuer Mechanik.
EQUILIBRIUM POSITIONS AND EQUILIBRIUM DOMAINS OF AUTONOMOUS SYSTEMS [UEBER DIE GLEICHGEWICHTSLAGEN UND GLEICHGEWICHTSBEREICHE NICHTLINEARER AUTONOMER SYSTEME]
Horst J. Klepp Jun. 1985 102 p refs In GERMAN; ENGLISH summary
(RUB-IFM-MITT-45) Copyright. Avail: Issuing Activity

The behavior of autonomous systems subject to discontinuous forces in the equilibrium positions and equilibrium domains was investigated. Using the piecewise defined potential, auxiliary functions for conservative systems with discontinuous displacement-dependent forces were determined. These functions are used for stability investigations of the equilibrium positions. Representative phase-phase portraits were established for systems with damping and friction. Particularities on the switching line due to the discontinuous transition from static to kinetic friction were pointed out. Direction elements for equilibrium positions and hence direction fields for equilibrium zones were defined in order to characterize the equilibrium positions inside equilibrium zones, based on the response of the system to small perturbations. The bifurcation points of the direction field were established for a model, and the influence of the parameters of the system and the perturbation on the bifurcation points was determined.
Author (ESA)

N86-15983# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A NEW ENUMERATION SCHEME FOR THE KNAPSACK PROBLEM
Horacio Hideki Yanasse and Nei Yoshihiro Soma Jun. 1985 18 p refs Presented at the School of Combinatorial Optimization, Rio de Janeiro, Jul. 1985
(INPE-3563-PRE/769) Avail: NTIS HC A02/MF A01

A new enumeration scheme to solve the one dimensional knapsack problem motivated by some observations on number theory, more specifically on the determination of the number solutions of linear diophantine equations is presented. This new algorithm is pseudopolynomial and its special features provide a reduction in the computational memory requirements as compared with other exact methods. Author

N86-15984# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
AN EXACT ALGORITHM FOR THE KNAPSACK PROBLEM [UM ALGORITMO EXATO PARA O PROBLEMA DA MOCHILA]
Horacio Hideki Yanasse and Nei Yoshihiro Soma Sep. 1985 9 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd ERMAC, Sao Jose dos Campos, Brazil, 16-17 May 1985
(INPE-3645-PRE/815) Avail: NTIS HC A02/MF A01

A new enumeration scheme to solve the one dimension knapsack problem is presented. This new algorithm is pseudopolinomial and, given its special features, there is probably a reduction on the computational memory requirements when compared to other exact methods. Author

N86-15985# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
LAPLACE TRANSFORMATION WITH REDUCE 2 [TRANSFORMADA DE LAPLACE NO REDUCE 2]
Frederico L. G. deFreitas (Univ. Federal de Pernambuco, Recife, Brazil) and Guilherme Bittencourt Sep. 1985 33 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Encontro Regional de Matematica Aplicada e Computacional, Sao Jose dos Campos, Brazil, 16-17 May 1985
(INPE-3649-PRE/816) Avail: NTIS HC A02/MF A01

A system for Laplace transform analytic calculation is presented; its structure and some results obtained making use of the system are shown. The system was developed based on the symbolic manipulation capabilities of the REDUCE 2 program. The B-6800 INPE-CNPq computer was used. In order to perform the Laplace transformations, routines were implemented, in the RLISP Language, to expand the symbolic manipulation capabilities of the REDUCE 2 program. Author

N86-15986# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
NONLINEAR CONTROL OF DISTRIBUTED PARAMETER SYSTEMS
J. A. M. FelippedeSouza Aug. 1985 7 p refs Presented at the 8th Congresso Nacional de Matematica Aplicada e Computacional, Florianopolis, Brazil, 16-20 Sep. 1985
(INPE-3623-PRE/807) Avail: NTIS HC A02/MF A01

The problem of control of nonlinear systems of the type z=Az + Nz + Bu, Z(0) = z sub 0, where A is linear, N is nonlinear, z is the state and u is the control is studied. The linear operator A is assumed to generate a strongly continuous semigroup S(t) on the state space Z. The problem of controllability is to find a control u(.) which drives the system from z sub 0 at t = 0 to a given desired state z sub d at t = T. Here we present the basic ideas of the results obtained when Z is a Hilbert space. Author

N86-15987# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil). Dept. Mecanica Espacial e Controle.
CONTROL OF NONLINEAR DISTRIBUTED PARAMETER SYSTEMS
J. A. M. FelippedeSouza Aug. 1985 9 p refs Presented at the 4th Coloquio de Control Automatico of the Centro de Investigacion y Estudios Avanzados, Mexico City, Mexico, 3-6 Sep. 1985
(INPE-3624-PRE/808) Avail: NTIS HC A02/MF A01

Some results in controllability of nonlinear systems of the type z = Az + Nz + Bu, where A is linear, N is nonlinear, B is linear, z is the state and u is the control is presented. It is assumed that the dynamics of the linear part (i.e., z = Az) can be described in terms of a strongly continuous semigroup on an appropriate Banach space (the state space), so that this formulation includes distributed parameter systems and delay systems, as well as lumped parameter systems. Theoretical results in controllability are obtained by using fixed point theorems. It is considered the space X of functions from the interval (0,T) to Z (the possible trajectories of the system). In this setting, some mappings F:X approaches the limit of X are constructed and the solution of the problem of nonlinear controllability is obtained via the fixed points of such F's. Author

N86-15988# Stanford Univ., Calif. Dept. of Computer Science.
CONSTRUCTING A PERFECT MATCHING IS IN RANDOM NC
R. M. Karp, E. Upfal, and A. Wigderson Mar. 1985 16 p
(Contract N00039-83-C-1036)
(AD-A157813; SU-STAN-CS-85-1043) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document shows that the problem of constructing a perfect matching in a graph is in the complexity class Random NC; i.e., the problem is solvable in polylog time by a randomized parallel algorithm using a polynomial-bounded number of processors. It is also shown that several related problems lie in Random NC. These include: Constructing a perfect matching of maximum weight in a graph whose edge weights are given in unary notation; Constructing a maximum-cardinality matching; Constructing a matching covering a set of vertices of maximum weight in a graph whose vertex weights are given in binary; and Constructing a maximum s-t flow in a directed graph whose edge weights are given in unary. Author (GRA)

N86-15989# Stanford Univ., Palo Alto, Calif. Dept. of Statistics.
RANDOM SEQUENTIAL CODING BY HAMMING DISTANCE
Y. Itoh and H. Solomon 11 Jul. 1985 13 p
(Contract N00014-76-C-0475)
(AD-A158003; SU-TR-360) Avail: NTIS HC A02/MF A01 CSCL 12/1

Simple cubic random packing and random packing by Hamming distance are analyzed. Consider the packing density gamma sub d of dimension d by cubic random packing. From simulations up to dimension 11, gamma sub d + 1/gamma sub d seems to approach one. Simulation results for random packing by Hamming distance are obtained. For the case of Hamming distances of 2 or 3, d-gamma fits the simulation results of packing density where gamma is an empirical constant. Author (GRA)

N86-15990# Tetra Tech, Inc., Arlington, Va.
A TARGET TRACKER USING A DOPPLER COMPENSATED CORRELATION TECHNIQUE Final Report
B. R. Eldridge 29 May 1985 57 p
(Contract N00014-81-C-0535)
(AD-A158087) Avail: NTIS HC A04/MF A01 CSCL 12/1

This document is the final research report on the investigation of a mathematical algorithm to do target tracking, using Doppler compensated correlation techniques on input time series streams from several passive acoustic sensors. The algorithm was developed and programmed into a testbed on a VAX-750 computer and was tested using simulated time series data generated by the Tetra Tech Broadband Signal Simulator. Algorithm performance proved disappointing due to: (1) numerical instabilities induced by structural anomalies in the sample signal autocorrelation function; (2) the extreme sensitivity of objective function to choice of signal characteristics and processing parameters; and (3) computational intensity of the algorithm. Author (GRA)

N86-15991# Aerodyne Research, Inc., Billerica, Mass.
OUTER PRODUCT CALCULATIONS Monthly Progress Report, Nos. 7, 8, 9 & 10, 19 Mar. 1985 - 15 Jul. 1985
Jul. 1985 44 p
(Contract N00014-84-C-2387)
(AD-A158295; ARI-4662; MPR-7/8/9/10) Avail: NTIS HC A03/MF A01 CSCL 12/1

Several progress reports are included in one. The following topics are reported; constrained projection operators; relation between generalized inverses and projection methods; weighted features and subspace methods; and outer product expansions - approximate singular value decompositions. GRA

N86-15992# Oxford Univ. (England). Mathematical Inst.
NONLINEAR DIFFUSION EQUATIONS Final Technical Report, 26 Jan. - 26 Oct. 1984
J. B. McLeod Jun. 1985 28 p
(Contract DAJA37-81-C-0220; DA Proj. 1T1-61102-BH-57)
(AD-A158305) Avail: NTIS HC A03/MF A01 CSCL 12/1

This report summarizes mathematical research in the physical and biological sciences. Topics include: Partial differential equations; Parabolic and elliptic equations; Diffusion processes; Convective systems; Nonlinear waves; Free boundary problems. GRA

N86-15993# University of Southern California, Los Angeles. Dept. of Electrical Engineering.
FURTHER INFORMATIONAL PROPERTIES OF THE NASH AND STACKELBERG SOLUTIONS OF LQG GAMES Final Report, Jun. 1982 - May 1984
G. P. Papavassilopoulos 21 May 1985 91 p
(Grant AF-AFOSR-0174-82)
(AD-A158569; Rept-53-4503-1797; AFOSR-85-0624TR) Avail: NTIS HC A05/MF A01 CSCL 12/1

This paper considers a two-decision-maker problem where each decision maker has his own information and studies the impact of improving the information of only one decision maker. In a previous document an example of a two-decision-maker LQG static Nash game was considered and was shown for that particular example that, on the one hand, if one of the decision makers improves his own information by obtaining his opponent's information (while his opponent's information does not change) then he ends up with a higher Nash cost; on the other hand, if he improves his own information by getting an extra measurement not from his opponent (while his opponent's information does not change) then he might incur lower Nash cost. This paper proves that in a general two-decision-maker LQG static or dynamic Nash game, if one of the decision makers knows all his opponent's information, then more or better information for him alone is beneficial to him. In static games the authors prove that more information for one of the decision makes alone is beneficial to him provided that such information is orthogonal to both decision maker's information. GRA

N86-15994# Wisconsin Univ., Milwaukee.
SIEVES AND A FILTER FOR GAUSSIAN PROCESSES Research Progress Report
J. Beder 25 Apr. 1985 5 p
(Grant AF-AFOSR-0329-84)
(AD-A158762; AFOSR-85-0621TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Results are reported on the first two conjectures that were to be investigated as described in the research proposal. Conjecture 1 has been established and follow-on results are obtained. What remains to be investigated is the use of these results to make confidence statements and to test hypotheses. Results which establish the truth of conjecture 2 are also reported. Author (GRA)

N86-15995# Iowa Univ., Iowa City.
RESIDUES OF INTEGRALS WITH THREE-DIMENSIONAL MULTIPOLE SINGULARITIES, WITH APPLICATION TO THE LAGALLY THEOREM Interim Report
L. Landweber Jul. 1985 22 p
(Contract N00014-83-K-0136)
(AD-A158771; IIHR-290) Avail: NTIS HC A02/MF A01 CSCL 12/1

An important mathematical relation in the theory of three-dimensional irrotational flow is the Gauss-Green transformation between volume and surface integrals. A very useful result of this transformation, Green's third formula, requires, in its derivation, the evaluation of the limit of a singular integral over the surface of a sphere as the radius of the sphere approaches zero. Since, in this case, the singularity is due to the potential of a source at the center of the sphere, its limit may be called the residue of a source. Similarly, limits of integrals over the surface of a sphere of vanishingly small radius, with higher-order derivatives of the source potential in the integrand, will be called residues for multipoles. The latter occur in the derivation of the Lagally theorem for the force and moment acting on a body moving in an irrotational flow when multipoles are present in the hydrodynamic singularity system within the body. In contrast to the very simple derivation of the residue occurring in Green's third formula, the evaluation of the multipole residues was a challenging application of the theory of spherical harmonics. The derivations of a set of multipole residues, which were required but not included in the aforementioned references, is in this document. GRA

N86-15996# Maryland Univ., College Park. Dept. of Mathematics.
A GRAPHICAL SIMILARITY MEASURE FOR TIME SERIES MODELS
B. Kedem Apr. 1985 24 p
(Grant AF-AFOSR-0187-82)
(AD-A158869; TR-85-10; AFOSR-85-0680TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The purpose of this document is to introduce a graphical device useful as a measure of similarity or as a goodness of fit criterion for hypothesized time series models. It is based on the actual oscillation observed in time series as depicted by axis-crossings and higher order crossings. Higher order crossings (HOC) are axis-crossings of differenced time series and are closely linked to the spectral content of the series. In fact under the Gaussian assumption, to which we shall adhere, HOC determine the finite dimensional distributions up to a scale parameter given that the mean is zero. The main advantage of HOC is that they are easily obtained from an observed series and that only very few of them are needed, as the dicriminatory power in HOC usually diminishes with their order. Higher order crossings in time series discrimination were discussed in Kedem and Slud (1981), (1982), where a certain goodness of fit criterion is suggested, Here, however, the emphasis is on a graphical device rather than a single test statistic. This graphical method may be shown useful in answering the question Does a given time series oscillate as a certain hypothesized model? Some examples with real and simulated data demonstrate the use and potential of this method. GRA

N86-15997# Rensselaer Polytechnic Inst., Troy, N.Y.
NUMERICAL METHODS FOR SINGULARLY PERTURBED DIFFERENTIAL EQUATIONS WITH APPLICATIONS Annual Scientific Report, 1 Jun. 1984 - 31 May 1985
J. E. Flaherty Jun. 1985 29 p
(Grant AF-AFOSR-0192-80)
(AD-A158969; AFOSR-85-0719TR) Avail: NTIS

HC A03/MF A01 CSCL 12/1

During the period covered by this report the investigators continued their research on the development and application of adaptive numerical methods for singularly perturbed initial-boundary value problems for partial differential equations. They continued their analysis of the stability of mesh moving schemes for one-dimensional parabolic problems. They also developed a moving mesh scheme with local refinement for two-dimensional hyperbolic systems and are considering a similar scheme for parabolic problems. They are applying our methods to several interesting physical problems, such as, elastic-plastic solids, combustion, and a nonlinear Schrodinger equation which exhibits self-focusing.

Author (GRA)

N86-15998# Pittsburgh Univ., Pa. Dept. of Electrical Engineering.

SHIFT-VARIANT MULTIDIMENSIONAL SYSTEMS Final Research Report, 1 Feb. 1983 - 31 Mar. 1985

N. K. Boss 29 May 1985 111 p

(Grant AF-AFOSR-0038-83)

(AD-A158973; AFOSR-85-0724TR) Avail: NTIS HC A06/MF A01 CSCL 12/1

To a great extent the techniques for analysis and restoration of images has been developed under the assumption that the system is linear shift-invariant (LSI). These techniques are successful in some cases because a system which is diffraction-limited or a system whose object plane undergoes uniform linear motion perpendicular to the system reference axis does indeed satisfy these assumptions. However, LSI systems are singled out for study mainly because of the widespread understanding of the Fourier Transform theory along with well-known fast algorithms for its implementation. In comparison with LSI systems, very little work has been done on linear shift-variant (LSV) systems. Most of the research on two dimensional LSV systems has been done on restoration techniques by means of coordinate transformations. This technique decomposes the LSV system into a distortion of the input plane followed by a shift-invariant operation and terminated by a distortion of the output plane. The primary objective of this research is to provide not only a mathematical structure for the state-space modeling of discrete LSV systems but to apply this model to the problems of efficient analysis and deconvolution of multidimensional systems. GRA

N86-15999# Brown Univ., Providence, R. I. Div. of Engineering.

CONTROL AND IDENTIFICATION OF TIME VARYING SYSTEMS Annual Technical Report, 30 Jun. 1984 - 29 Jun. 1985

A. E. Pearson 26 Jul. 1985 9 p

(Grant AF-AFOSR-0230-82)

(AD-A159067; AFOSR-85-0690TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Research is summarized for a projected integral equation error technique used in the parameter identification of differential-delay equation models, including the time delay estimation problem for received signals. Current research on a fresh look at the Shinbrot method of moment functionals is described relating to the modeling and identification of linear, bilinear and polynomial input-output differential systems. Current research is also described for the feedback stabilization of state delayed control systems using a reducing transformation technique. Author (GRA)

N86-16000# Pittsburgh Univ., Pa. Center for Multivariate Analysis.

STRONG REPRESENTATION OF WEAK CONVERGENCE

Z. D. Bai and W. Q. Liang Jul. 1985 40 p

(Contract F49620-85-C-0008)

(AD-A159078; TR-85-29; AFOSR-85-0683TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

It is well known that there is a big difference between the concepts of weak and strong convergence of random variables. In the area of limiting theory, it is of interest to study the difference as well as the link between the two concepts of convergence.

GRA

N86-16001# North Carolina State Univ., Raleigh. Center for Stochastic Processes.

EXTREME VALUE THEORY AND DEPENDENCE Technical Report, Sep. 1984 - Aug. 1985

M. R. Leadbetter Jul. 1985 8 p

(Contract F49620-82-C-0008)

(AD-A159138; TR-109; AFOSR-85-0692TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The purpose of this paper is to give a very brief account of some of the essential ideas underlying classical extreme value theory, and to see how these are used (modified as necessary) for dependent cases. In particular it will be shown how the classical theory still applies for moderately dependent stationary sequences, but that under higher local dependence, clustering of high values occurs, requiring modifications of the theory especially as it involves order statistics other than the maximum. Underlying concepts (especially point process convergence results) are emphasized.

Author (GRA)

N86-16002# Ecodynamics Research Associates, Inc., Albuquerque, N. Mex.

ADAPTIVE GRID GENERATION USING ELLIPTIC GENERATING EQUATIONS WITH PRECISE COORDINATE CONTROLS Annual Report, 27 Jan. 1984 - 15 Aug. 1985

P. J. Roache 31 Jul. 1985 7 p

(Contract F49620-84-C-0079)

(AD-A159158; AFOSR-85-0708TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The investigators are in the final stages of developing a toolkit of symbol manipulation codes for variational grid generation. They will present an invited paper on this work at an AIAA Aerospace Sciences Meeting. They have also discovered an unexpected folding of the grid for a design case using a popular grid generation code. A paper analyzing the problem was presented at the AIAA Computational Fluid Dynamics Meeting in July. The analysis has suggested practical values of relative weighting parameters for use in variational grid generation techniques. A paper has been submitted to the Journal of Applied Mathematics and Computation.

Author (GRA)

N86-16003# Pittsburgh Univ., Pa. Center for Multivariate Analysis.

NON-UNIFORM BOUNDS OF NORMAL APPROXIMATION FOR FINITE-POPULATION U-STATISTICS

M. Baiqi and Z. Lincheng Jul. 1985 38 p Prepared in cooperation with China University of Science and Technology, Hofei

(Contract F49620-85-C-0008)

(AD-A159163; TR-85-26; AFOSR-85-0696TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The nonuniform bounds of normal approximation for finite population U statistics are discussed. Statistical distribution methods are presented. B.S.

N86-16004# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.

A PERTURBATION APPROACH TO ROBOT CALIBRATION Interim Technical Report

H. O. K. Kirchner, B. Gurumoorthy, and F. B. Prinz Apr. 1985 25 p

(AD-A159166; CMU-RI-TR-85-9) Avail: NTIS HC A02/MF A01 CSCL 12/1

The forward and reverse solutions of a manipulator with six joints are expanded up to second order in the 24 joint parameters. This paper attempts to establish a mathematical reference frame for geometric errors only. No attempt is made to quantify the relative contribution of geometric and non-geometric errors, since this ratio is application dependent and will also depend on the design of the manipulator itself. Since in high speed operations high positional accuracy is desirable, we address the question of how to cope with geometric deviations from the ideal manipulator configuration. GRA

N86-16005# Washington State Univ., Pullman.
RAPIDLY CONVERGENT ALGORITHMS FOR NONSMOOTH OPTIMIZATION Annual Scientific Report, 15 Jul. 1984 - 14 Jul. 1985
R. Mifflin 14 Jul. 1985 6 p
(Grant AF-AFOSR-0210-83)
(AD-A159168; AFOSR-85-0713TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This research has led to new developments for solving nonlinear optimization problems involving functions that are not everywhere differentiable and/or are implicitly defined, such as those that arise from dual formulations of optimization models. A rapidly convergent, both in the theoretical and the practical sense, algorithm has been developed for the single variable case where generalized derivatives are available. It is being extended to the case where only function values are known. Some of the single variable results, including the concept of better than linear convergence, have been extended to the multivariable case. In order to solve efficiently the particular quadratic programming subproblems generated by the n-variable method a specialized QP algorithm has been developed. Author (GRA)

N86-16006# Naval Postgraduate School, Monterey, Calif.
LAPLACIAN SMOOTHING SPLINES WITH GENERALIZED CROSS VALIDATION FOR OBJECTIVE ANALYSIS OF METEOROLOGICAL DATA Technical Report, Oct. 1984 - Mar. 1985
R. Franke Aug. 1985 37 p
(AD-A159336; NPS53-85-0008) Avail: NTIS HC A03/MF A01 CSCL 12/1

The use of Laplacian smoothing splines (LSS) with generalized cross validation (GCV) to choose the smoothing parameter for the objective analysis problem is investigated. Simulated 500 mb pressure height fields are approximated from first-guess data with spatially correlated errors and observed values having independent errors. It is found that GCV does not allow LSS to adapt to variations in individual realizations, and that specification of a single suitable parameter value for all realizations leads to smaller rms error overall. While the tests were performed in the context of data from a meteorology problem, it is expected the results carry over to data from other sources. A comparison shows that significantly better approximations can be obtained using LSS applied in a unified manner to both first-guess and observed values rather than in a correction to first-guess scheme (as in Optimum Interpolation) when the first-guess error has low spatial correlation. GRA

N86-16007# Rome Univ. (Italy). Dipt. di Fisica.
THREE FAMILIES OF INTEGRABLE ONE-PARTICLE POTENTIALS
S. Wojciechowski (Manchester University, UK) 7 Feb. 1985 18 p refs Sponsored by UK Science and Engineering Research Council
(Preprint-440) Avail: NTIS HC A02/MF A01

A simple recursive description of three infinite families of integrable potentials of a natural hamiltonian system of n degrees of freedom is given. For each family a set of n rational integrals of motion in involution which depend quadratically on the momenta is found. This is the reminiscence of the fact that these hamiltonians are, basically, separable either in generalized elliptic or conical-spherical or generalized parabolic coordinates but are difficult to determine this way. Consequently, the potentials remain integrable when they are constrained to a quadric surface defined by constant values of separation variables. As such they include a Neumann system and a Jacobi problem of the geodesic motion on n-axial ellipsoid as particular cases. The constrained systems are described in a global way using rational integrals of motion.
Author (ESA)

N86-16008# Rome Univ. (Italy). Dipt. di Fisica.
SOME SOLVABLE DYNAMICAL SYSTEMS
F. Calogero 26 Feb. 1985 4 p refs Presented at Giornata di Geometria Meeting, Rome, Italy, Jun. 1984 Submitted for publication
(Preprint-441) Avail: NTIS HC A02/MF A01

A class of dynamical systems, i.e., systems of coupled nonlinear ordinary differential equations (ODE) is introduced. For systems which can be integrated, it is shown that their solution is provided by the zeros of explicity known polynomials (depending on the initial conditions and time). Others are not completely integrable but allow drastic simplifications, such as the transition from a system of n nonlinear second-order ODEs to a single nonautonomous nonlinear first-order ODE. Author (ESA)

N86-16009# Rome Univ. (Italy). Dipt. di Fisica.
BACKLUND TRANSFORMATIONS: TOOLS TO FIND NOVEL INTEGRABLE EVOLUTION EQUATIONS
A. Degasperis 4 Mar. 1985 11 p refs Presented at Workshop on Rencontre Interdisciplinaire Problemes Inverses, Montpellier, France, 27 Nov.-1 Dec. 1984
(Preprint-443) Avail: NTIS HC A02/MF A01

Two techniques to search for novel evolution equations, starting from a given one, by using Backlund transformations, are given. The first technique is a method to reduce the number of dependent variables of a system of coupled evolution equations. The second technique is a way of associating to a given evolution equation (integrable by the spectral transform) another evolution equation (the modified equation). Author (ESA)

N86-16010# Rome Univ. (Italy). Dipt. di Fisica.
CONNECTANCE AND EQUIPARTITION THRESHOLDS IN HAMILTONIAN SYSTEMS
A. Giansanti, M. Pettini (Osservatorio Astrofisico di Arcetri, Florence), and A. Vulpiani 6 Mar. 1985 10 p refs
(Preprint-445) Avail: NTIS HC A02/MF A01

The effect of increasing connectance (i.e., number of interacting neighboring masses) on the equipartition threshold of a Fermi, Pasta, Ulam model with 32 mass points is considered. Increasing the number of interacting neighbor mass points from 2 to 3, 4, and 5 and keeping constant the effective strength of the nonlinear terms, no apparent effect on the critical energy for equipartition is observed. Author (ESA)

N86-16011# National Geodetic Survey, Rockville, Md.
VARIANCE COMPONENT ESTIMATION METHOD FOR SPARSE MATRIX APPLICATIONS
J. R. Lucas Jun. 1985 19 p
(PB85-234383; NOAA-TR-NOS-111-NGS-33) Avail: NTIS HC A02/MF A01 CSCL 12A

Methods for estimating variance components from the observation data used in a least squares adjustment are becoming important in geodesy because of the variety of data that need to be combined into a single adjustment. Unbiased estimators of the MINQUE (Minimum Norm Quadratic Unbiased Estimation) type have received the most attention, but these estimators have some shortcomings that make them unattractive in certain applications. In particular, they require the full inverse of the least squares normal equation matrix, thus limiting the use of sparse matrix methods so common to geodesy. An iterative estimation method is proposed which may not be unbiased, but produces reliable estimates in controlled numerical tests and is compatible with sparse matrix adjustments. Some results are presented which compare this estimator with MINQUE and iterated MINQUE when applied to a particular adjustment problem. GRA

N86-15427# Hokkaido Univ., Sapporo (Japan).
ACCURACY OF POLYNOMIAL APPROXIMATION OF QUASI-MINIMAX METHODS
Tsutomu Da-Te and Mayuka Kawaguchi *In its* Bulletin of the Faculty of Engineering, Hokkaido Univ., No. 128 Oct. 1985 64 p refs In JAPANESE; ENGLISH summary (For primary document see N86-15420 06-31)
Avail: NTIS HC A06/MF A01

N86-15428# Hokkaido Univ., Sapporo (Japan).
ANALYSIS OF DROPS IN ACCURACY OF LEAST-SQUARES APPROXIMATION

Mayuka Hawaguchi and Tsutomu Da-Te *In its* Bulletin of the Faculty of Engineering, Hokkaido Univ., No. 128 Oct. 1985 64 p refs In JAPANESE; ENGLISH summary (For primary document see N86-15420 06-31)
Avail: NTIS HC A06/MF A01

N86-15483# Joint Publications Research Service, Arlington, Va.
PSEUDOINVERSE RESTORATION OF BLURRED IMAGE IN UNIFORM MOTION
Si Xianyu, Zhang Guanshen, Zhang Shaoying, and Li Yongguo *In its* China Report: Science and Technology (JPRS-CST-85-040) 20 Nov. 1985 p 50-56 refs Transl. into ENGLISH from Journal of Sichuan Univ. Natural Science Edition (Chengdu, China), no. 2, 1985 p 44-49 (For primary document see N86-15478 06-31)
Avail: NTIS HC A06/MF A01

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N86-16012# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
MERITS AND DEMERITS OF THE MAXIMUM ENTROPY SPECTRAL ANALYSIS (MESA) METHOD
Rajarem P. Kane Jul. 1985 12 p refs Presented at the 2nd Encontro Regional de Matematica Aplicada e Computacional da SBMAC, San Jose dos Campos, Brazil, 16-17 May 1985 Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico
(INPE-3590-PRE/787) Avail: NTIS HC A02/MF A01

From the analysis of an artificial sample, it is shown that the Maximum Entropy Spectral Analysis (MESA) method is far superior to the Blackman and Tukey method. However, MESA has certain demerits like peak-splitting of low periodicities when large Lengths of the Prediction Error Filter (LPEF) are used, as also frequency shifts (errors) as large as 20% for large periodicities. Also, amplitudes cannot be estimated correctly. Hence, it is recommended that only periodicities may be located by MESA and then a Multiple Regression Analysis be carried out to estimate the amplitude. Author

N86-16013# Florida State Univ., Tallahassee. Dept. of Statistics.
MEAN RESIDUAL LIFE: THEORY AND APPLICATIONS Interim Report
F. Guess and F. Proschan Jun. 1985 21 p
(Contract F49620-85-C-0007)
(AD-A158589; FSU-Statistics-M702; AFOSR-85-0630TR; AFOSR-85-178TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

In the last two decades, reliabilists, statisticians, and others have shown intensified interest in the mean residual life (MRL) and derived many useful results concerning it. Given that a unit is of age t, the remaining life after time t is random. The expected value of this random residual life is called the mean residual life at time t. Since the MRL is defined for each time t, we also speak of the MRL function. THe MRL function is like the density function the moment generating function, or the characteristic function: for a distribution with a finite mean, the MRL completely determines the distribution via an inversion formula. Not only is the MRL used for parametric modeling but also for nonparametric modeling. Large non-parametric classes of life distributions such as decreasing mean residual life (DMRL) and new better than used in expectation (NBUE) have been defined using MRL. This paper defines the MRL function formally and survey some of the key theories. Its wide range of applications is also discussed.
Author (GRA)

N86-16014# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
STOCHASTIC INTEGRATION FOR OPERATOR VALUED PROCESSES ON HILBERT SPACES AND ON NUCLEAR SPACES
H. Korezlioglu and C. Martias Dec. 1984 57 p
(Contract F49620-82-C-0009)
(AD-A158878; TR-85; AFOSR-85-0681TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

The representation of a nuclear space valued square integrable martingale in terms of another nuclear space valued square integrable martingale is given in terms of stochastic integrals of operator valued processes. The construction of the stochastic integral goes through that of operator valued processes on Hilbert spaces. A new approach is given for the Hilbertian case, so that only the integration of Hilbert-Schmidt operator valued processes is needed for the representation of square integrable martingales.
Author (GRA)

N86-16015# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
DEGENERATE MULTIVARIATE STATIONARY PROCESSES: BASICITY, PAST AND FUTURE, AND AUTOREGRESSIVE REPRESENTATION
A. G. Miamee and M. Pourahmadi May 1985 40 p
(Contract F49620-82-C-0009)
(AD-A158879; TR-99; AFOSR-85-0675TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

An important problem in prediction theory of weakly stationary stochastic processes (WSSP) is to find conditions on the process, or equivalently on its spectral distribution F, so that the linear least square predictor of a future value of the process admits a mean-convergent series representation in terms of the past (observed) values of the process. Recently, using the notion of positivity of the angle between the past-present and the future subspaces of the process it was shown by Pourahmadi that the series representation of the predictor is possible under some weaker conditions. This was made possible by using the idea of angle due to Helson and Szego for a multivariate extension of this. However, these results hold under conditions which require the process to be full rank. The main purpose of this document is to consider the same problem, including their autoregressive representation, for the degenerate WSSP's. GRA

N86-16016# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
ON THE NUMBER OF BOOTSTRAP SIMULATIONS REQUIRED TO CONSTRUCT A CONFIDENCE INTERVAL
P. Hall Mar. 1985 16 p
(Contract F49620-82-C-0009)
(AD-A158880; TR-97; AFOSR-85-0678TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The purpose of this document is to make two points about the effect of the number of bootstrap simulations, B, on percentile-t bootstrap confidence intervals. The first point concerns coverage probability; the second, distance of the simulated critical point form the true critical point derived with B=infinity. In both cases the author has in mind applications to smooth statistics, such as the Studentized mean of a sample drawn from a continuous distribution. He indicates the change that have to be made if the distribution of the statistic is not smooth. GRA

N86-16017# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
STOCHASTIC INTEGRALS AND PROCESSES WITH INDEPENDENT INCREMENTS
W. N. Hudson Mar. 1985 61 p
(Contract F49620-82-C-0009)
(AD-A158939; TR-98; AFOSR-85-0679TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

Stochastic integrals are defined using processes with independent increments as integrators. A simple and perhaps new method is given for obtaining approximating simple integrands. In the special case where the integrand is a stable motion of index p epsilon the integrand may have paths in Lp. Basic properties are established. Then the characteristic functions of integrals involving nonrandom integrands are computed and used to

establish necessary and sufficient conditions for the independence of such integrals. Author (GRA)

N86-16018# North Carolina Univ., Chapel Hill. Dept. of Statistics.
ON THE ANGLE FOR STATIONARY RANDOM FIELDS Technical Report, Sep. 1984 - Aug. 1985
A. G. Miamee and H. Niemi Apr. 1985 23 p
(Contract F49620-82-C-0009)
(AD-A158982; TR-92; AFOSR-85-0677TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The angle between past and future for stationary random fields on the lattice points of the plane is defined and it is shown that in contrast with other problems related to the past of random fields the positivity of the angle between past and future is independent of different pasts which have been considered. Most of the known facts concerning the angle for stochastic processes have been extended to the case of random fields. Author (GRA)

N86-16019# Pittsburgh Univ., Johnstown, Pa. Center for Multivariate Analysis.
ON THE MATRIX CONVEXITY OF THE MOORE-PENROSE INVERSE AND SOME APPLICATIONS
D. G. Kaffes, M. B. Rao, T. Mathew, and K. Subramanyam Jul. 1985 18 p
(Contract F49620-85-C-0008)
(AD-A158992; TR-85-28; AFOSR-85-0697TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper gives necessary and sufficient conditions for the validity of an inequality. GRA

N86-16020# Pittsburgh Univ., Johnstown, Pa. Center for Multivariate Analysis.
INADMISSIBILITY OF THE BEST EQUIVARIANT ESTIMATORS OF THE VARIANCE-COVARIANCE MATRIX AND THE GENERALIZED VARIANCE UNDER ENTROPY LOSS
B. K. Sinha and M. Ghosh Jul. 1985 22 p
(Contract F49620-85-C-0008; Grant NSF DMS-82-18191)
(AD-A159059; TR-85-27; AFOSR-85-0698TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Based on a data matrix and an independent Wishart matrix estimators dominating the best equivariant estimators of sigma and (sigma) are obtained under two types of entropy loss. For simultaneous estimation of the mean vector and the variance covariance matrix of a multinormal population, a suitable entropy loss is developed and estimators dominating the pair consisting of the sample mean vector and the best multiple of the sample Wishart matrix are derived. A technique of SINHA is heavily exploited. GRA

N86-16021# Purdue Univ., West Lafayette, Ind. Dept. of Statistics.
MULTIPLE DECISION PROCEDURES FOR TUKEY'S GENERALIZED LAMBDA DISTRIBUTIONS
J. K. Sohn Aug. 1985 129 p
(Contract N00014-84-C-0167)
(AD-A159153; TR-85-20) Avail: NTIS HC A07/MF A01 CSCL 12/1

Selection and ranking (more broadly multiple decision) problems arise in many practical situations since it is now well-recognized that the classical tests of homogeneity usually do not provide the answers the experimenter wants. This thesis studies Tukey's lambda distributions as the underlying model for selection and ranking problems. It is known that the family of Tukey's generalized lambda distributions is very broad and contains most well-known distributions as special cases. Chapter 1 deals with selection and ranking problems based on sample medians for the symmetric lambda distributions and gives applications of the lambda family distributions. In Chapter 2, the problems of isotonic selection procedures for the family of lambda distributions and for logistic distributions are considered. Chapter 3 deals with the problem of choosing the optimal score function for different nonparametric procedures proposed by Nagel (1970) and Gupta and McDonald (1970). A Monte Carlo study is carried out. In Chapter 4, a two-stage elimination-type procedure under the Bayesian setting is proposed and its properties are studied. In particular, we use a stopping rule to construct a 100(1-2 alpha)% Highest Posterior Density Credible regions with a common width 2d for the unknown means of selected populations at stage 1. A Monte Carlo study is carried out to examine the performance of the proposed procedure. GRA

N86-16022# Purdue Univ., West Lafayette, Ind. Dept. of Statistics.
ON THE LEAST FAVORABLE CONFIGURATION OF A SELECTION PROCEDURE BASED ON RANKS
S. S. Gupta and T. Matsui Aug. 1985 26 p
(Contract N00014-84-C-0167)
(AD-A159154; TR-85-19) Avail: NTIS HC A03/MF A01 CSCL 12/1

This document considers two types of statistics based on the sums of combined (Wilcoxon type) ranks and vector (Friedman type) ranks. Underlying populations are supposed to belong to the location or scale parameter family of distributions. Two approaches - subset selection and indifference zone - of ranking and selection procedures based on these statistics are considered in an asymptotic framework for selecting the population with the largest parameter value. The least favorable configurations of parameters are discussed by computing the exact moments of these statistics and introducing an assumption of order relation between the gaps of parameters. Author (GRA)

N86-16023# Purdue Univ., West Lafayette, Ind. Dept. of Statistics.
A LOWER CONFIDENCE BOUND ON THE PROBABILITY OF A CORRECT SELECTION
W. C. Kim Aug. 1985 18 p Prepared in cooperation with Seoul National Univ., South Korea
(Contract N00014-84-C-0167)
(AD-A159164; TR-85-18) Avail: NTIS HC A02/MF A01 CSCL 12/1

In the problem of selecting the best of k populations, a natural rule is to select the population corresponding to the largest sample value of an appropriate statistic. As a retrospective analysis, a lower confidence bound on the probability of a correct selection is derived when the probability density function has the monotone likelihood ratio property under the location parameter setting. The result is applied to the normal populations with both known and unknown common variance. Tables to implement the confidence bound are provided. Author (GRA)

N86-16024# North Carolina State Univ., Raleigh. Center for Stochastic Processes.
ON DETERMINING THE PREDICTOR OF NON-FULL-RANK MULTIVARIATE STATIONARY RANDOM PROCESSES
A. G. Miamee Mar. 1985 20 p
(Contract F49620-82-C-0009)
(AD-A159165; TR-96; AFOSR-85-0682TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Algorithms for determining the generating function and the predictor for some non-full-rank multivariate stationary stochastic process are obtained. In fact it is shown that the well known algorithms given by Wiener and Masani (1958) for the full-rank case, are valid in certain non-full-rank cases exactly in the same form. Author (GRA)

N86-16025# Stanford Univ., Calif. Dept. of Statistics.
TESTS FOR A CHANGE-POINT
B. James, K. L. James, and D. Siegmund Aug. 1985 35 p
(Contract N00014-77-C-0306; Grant NSF MCS-80-24649; NR Proj. 042-373)
(AD-A159381; SU-TR-35) Avail: NTIS HC A03/MF A01 CSCL 12/1

The problem considered is that of testing a sequence of independent normal random variables with constant, known or unknown, variance for no change in mean versus alternatives with a single change-point. Various tests, such as those based on the

likelihood ratio and recursive residuals, are studied. Power approximations are developed by integrating approximations for conditional boundary crossing probabilities. A comparison of several tests is made, and the power approximations obtained are compared with Monte Carlo values. GRA

N86-16026# Tilburg Univ. (Netherlands). Subdept. of Social-Cultural Science.
A COMPUTER PROGRAM FOR ANALYZING LOGLINEAR MODELS WITH LATENT VARIABLES: LCAG [LCAG- EEN COMPUTERPROGRAMMA VOOR DE ANALYSE VAN LOGLINIAIRE MODELLEN MET LATENTE VARIABELEN]
J. A. P. Hagenaars and M. A. G. vanderWalle (Katholieke Hogeschool, Tilburg, Netherlands) 1985 19 p refs In DUTCH Presented at Symposium Statistical Software, Utrecht, Netherlands, 1983
Avail: NTIS HC A02/MF A01

A program (LCAG) to analyze latent-class-models, explaining relations between nominally measured variables from relations between these variables and an underlying, discrete, Latent Variable (LV), is described. The program is developed for statistic sociological purposes. The parameters are obtained using maximum likelihood ratio chi square or Pearsons chi square. To use LCAG to estimate parameters of any identifiable hierarchical loglinear model with LVs, as well as nonhierarchical models, two extensions to the Goodman algorithm are introduced. Possibilities to set up a hierarchical loglinear model for relations between the LVs and to adopt LVs within models, for which parameters must be estimated according to the modified path analysis approach, are elaborated. Tests show adequate model processing. Author (ESA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N86-16027# Florida Univ., Gainesville. Center for Mathematical System Theory.
RESEARCH IN APPLIED MATHEMATICS RELATED TO NONLINEAR SYSTEM THEORY Final Report, 10 Aug. 1981 - 9 Aug. 1984
R. E. Kalman Aug. 1985 11 p
(Contract DAAG29-81-K-0136)
(AD-A158330; ARO-18343.44-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

Document includes a bibliography listing post doctoral research performed at the Center for Mathematics System Theory at the University of Florida. GRA

N86-16028# Texas Univ., Austin. Center for Cybernetic Studies.
THE EQUAL FLOW PROBLEM
I. Ali, J. Kennington, and B. Shetty Apr. 1985 42 p
(Contract N00014-82-K-0295; Grant AF-AFOSR-0278-83)
(AD-A159594; CCS-RR-511) Avail: NTIS HC A03/MF A01 CSCL 12/2

This paper presents a new algorithm to solve a network problem with equal flow wide constraints. The proposed solution technique is motivated by the desire to exploit the special structure of the side constraints and to maintain as much of the characteristics of pure network problems as possible. Our solution technique for the equal flow problem consists of solving two sequences of pure network problems. One sequence yields tighter lower bounds on the optimal value by considering the Lagrangean relaxation of the equal flow problem in which the side constraints are dualized. The second sequence yields upper bounds on the optimal value for the problem and maintains a feasible solution at all times. This sequence is obtained by considering a reformulation of the equal flow problem based on parametric changes in the requirements vector. The procedure has the added attractive feature that it provides a feasible solution which is known to be within a percentage of the optimal at all times. As such, the algorithm terminates when a solution with a prespecified tolerance on the objective function value is obtained. On NETGEN problems, using the first 150 arcs to form 75 equal flow side constraints, we found that the new algorithm is approximately 3 times faster than existing techniques and requires only 50% of the storage. GRA

N86-16029# Sheffield Univ. (England). Dept. of Control Engineering.
INTRODUCTION TO NONLINEAR SYSTEMS ANALYSIS AND IDENTIFICATION
S. A. Billings Jun. 1985 30 p refs Presented at Science and Engineering Research Council (SERC) Vacation School on Signal Processing for Control, Warwick, England, 15-20 Sep. 1985
(Grants SERC-GR/B/31163; SERC-GR/D/30587)
(RR-277) Avail: NTIS HC A03/MF A01

Methods for the statistical analysis of static and dynamic nonlinear systems are reviewed. Linearization methods, system identification algorithms, and stochastic control are discussed. Author (ESA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N86-16030# Rome Univ. (Italy). Dipt. di Fisica.
NONLINEAR EVOLUTION EQUATIONS ASSOCIATED WITH A RIEMANN-HILBERT SCATTERING PROBLEM
A. Degasperis, P. M. Santini, and M. J. Ablowitz (Clarkson Coll. of Technol., Potsdam, N.Y.) 24 Apr. 1985 14 p refs
(Contract N00014-76-C-0867; Grants NSF DMS-82-02117; AF-AFOSR-0005-84)
(Preprint-458) Avail: NTIS HC A02/MF A01

Nonlinear evolution equations associated with a Riemann-Hilbert scattering problem which reduces, in an appropriate limit, to the Zakharov-Shabat-AKNS scattering problem are considered. Constraints associated with the scattering problem and their impact upon the evolution equations are discussed. The direct linearization of the nonlinear evolution equations and an algorithm to construct an N-soliton solution are given. Author (ESA)

N86-16031# Rome Univ. (Italy). Dipt. di Fisica.
RELATION BETWEEN THE SUPERTABLEAUX OF THE SUPERGROUPS ORTHOSYMPLECTIC OSP (2 2) AND SUPERUNITY SU (1 2)
Michel Gourdin (Paris VI Univ., France) 6 May 1985 18 p refs
(Preprint-459) Avail: NTIS HC A02/MF A01

The classification and the interpretation of the Young supertableaux of the orthosymplectic group OSP (2 2) are given. A comparison is made with the supertableaux of the superunitary group SU (1 2) taking advantage of the isomorphism of the corresponding superalgebras. Author (ESA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N86-16032# Technische Hogeschool, Delft (Netherlands). Lab. of Engineering Mechanics.
TRIPLE PENDULUM FOR THE DEMONSTRATION OF NONLINEAR COUPLING [DRIEVOUDIGE SLINGER VOOR DE DEMONSTRATIE VAN NIET-LINEAIRE KOPPELING]
M. N. Baaijens and Nikolaus Rott (Eidgenoessische Technische Hochschule) 1983 56 p refs Partly in ENGLISH, DUTCH, and GERMAN
(Lab-Rept-763) Avail: NTIS HC A04/MF A01

The motions of a triple pendulum, showing strong coupling were simulated by a microcomputer. Multiple pendulums, providing examples of strong quadratic coupling were investigated. For individual titles, see N86-16033 through N86-16034.

N86-16033# Technische Hogeschool, Delft (Netherlands).
TRIPLE PENDULUM FOR THE DEMONSTRATION OF NONLINEAR COUPLING [DRIEVOUDIGE SLINGER VOOR DE DEMONSTRATIE VAN NIET-LINEAIRE KOPPELING]
M. N. Baaijens *In its* Triple Pendulum for the Demonstration of Nonlinear Coupling 1983 22 p ref In DUTCH (For primary document see N86-16032 06-70)
Avail: NTIS HC A04/MF A01

The motions of a triple pendulum were simulated by a microcomputer. The starting point was the Besseling program for rod constructions. The equations of motion showing strong coupling were numerically integrated, using the Runge-Kutta method. The iteration phase of the program takes a long time. The speed of input-output operations is a limiting factor for real-time representations. The most important computer programs are enclosed.
Author (ESA)

N86-16034# Eidgenoessische Technische Hochschule, Zurich (Switzerland).
A MULTIPLE PENDULUM FOR THE DEMONSTRATION OF NONLINEAR COUPLING
Nikolaus Rott *In* Technische Hogeschool, Delft Triple Pendulum for the Demonstration of Nonlinear Coupling 1983 33 p refs Partly in ENGLISH, DUTCH, and GERMAN (For primary document see N86-16032 06-70)
Avail: NTIS HC A04/MF A01

Multiple pendulums, providing examples of strong quadratic coupling were investigated. The equations of motion were derived. A simple intuitive explanation of the strong coupling in the case of the 1:2 tuning is given. The strongest coupling occurs when the two pivot points lie on an horizontal axis, and when the frequency ratio is 1:2. A model which shows that the energy exchange between the two oscillating bodies is periodic is given; the frequency is proportional to the amplitude. Author (ESA)

N86-16035# Oak Ridge National Lab., Tenn.
FIRST-PRINCIPLES CALCULATION OF THE MAGNETIC PROPERTIES OF PARAMAGNETIC fcc IRON
D. D. Johnson, B. L. Gyorffy, F. J. Pinski, J. Staunton, and G. M. Stocks 1985 13 p Presented at the International Conference on Magnetism, San Francisco, Calif., 26 Aug. 1985 Prepared in cooperation with Briston Univ., England, Warwick Univ., Coventry, England and Cincinnati Univ., Ohio
(DE-AC05-84OR-21400)
(DE85-017155; CONF-850890-15) Avail: NTIS HC A02/MF A01

Using the disordered local moment picture of itinerant magnetism, we present calculations of the temperature and volume dependence of the magnetic moment and spin-spin correlations for fcc Fe in the paramagnetic state. These calculations are based on the parameter-free, first principles approach of local spin density functional theory and the coherent potential approximation is used to treat the disorder associated with the random orientation of the local moments. DOE

N86-16036# Los Alamos National Lab., N. Mex.
COMPUTER SIMULATION OF NONEQUILIBRIUM PROCESSES
D. C. Wallace Jul. 1985 14 p Presented at the American Physical Society Topical Conference on Shock Waves in Condensed Matter, Spokane, Washington, 22 Jul. 1985
(Contract W-7405-eng-36)
(DE85-015708; LA-UR-85-2473; CONF-850736-56) Avail: NTIS HC A02/MF A01

The underlying concepts of nonequilibrium statistical mechanics, and of irreversible thermodynamics, will be described. The question at hand is then, how are these concepts to be realized in computer simulations of many-particle systems. The answer will be given for dissipative deformation processes in solids, on three hierarchical levels: heterogeneous plastic flow, dislocation dynamics, an molecular dynamics. Applications to the shock process will be discussed. DOE

N86-15607# Joint Publications Research Service, Arlington, Va.
EFFECT OF CONDUCTOR PROFILE ON FORCE CHARACTERISTICS DUE TO MOTION OF A MAGNETIC FIELD SOURCE Abstract Only
V. I. Astakhov and M. V. Bondarenko *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 57-58 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Elektromekhanika (Novocherkassk, USSR), no. 11, Nov. 1984 p 8-12 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N86-16037 National Physical Lab., Teddington (England). Div. of Information Technology and Computing.
A COMPUTER MODEL OF PERIPHERAL AUDITORY PROCESSING
M. P. Cooke May 1985 55 p refs
(NPL-DITC-58/85; ISSN-0262-5369) Copyright. Avail: Issuing Activity

Research towards an analysis of the speech waveform based on human auditory processing is summarized. Signal transformations believed to occur in the peripheral auditory system are described. A computer model which implements phase-locking, two-tone suppression, and adaptation is presented. A variety of stimuli are used to test the response of the computer model. Parameter-controlled synthetic speech creates nonstationary and noisy data. The significant contribution of the auditory model to the representation of such stimuli is demonstrated. It is suggested that the model provides speech transformations which are robust and which emphasize perceptually important features contained in the waveform. Author (ESA)

N86-16038 Forschungsinstitut fuer Hochfrequenzphysik, Werthoven (West Germany).
UNDERWATER SOUND COMMUNICATION
F. Schmitt Jun. 1985 54 p refs In GERMAN; ENGLISH summary
(Contract BMVg-GF-84/SuK-2.5)
(Rept-5-85; LFD-236) Copyright. Avail: Issuing Activity

Underwater acoustic signal transmission was investigated. The successful application of spread spectrum techniques in acoustic underwater transmission channels is controlled by the stochastic nature of the channel. The coherent gain losses due to the limited coherence time and coherence bandwidth of the channel were calculated for FM-chirp and PN-code modulated signals. Further gain losses occur due to the mismatch between the actual and the assumed relative speed between transmitter and receiver. The chirp signal is less sensitive to Doppler mismatch and thus requires fewer Doppler channels. The possibility of reducing the redundancy of speech signals and thus of reducing the stringent coherence constraints on the channel is discussed. Author (ESA)

N86-16039 Forschungsinstitut fuer Hochfrequenzphysik, Werthoven (West Germany).
ESTIMATION OF THE TRAJECTORY PARAMETERS OF AN ACCELERATIONLESS TARGET FROM ANGLE MEASUREMENTS OF A SINGLE, STATIONARY, ACOUSTIC SENSOR. ERROR SOURCES AND THEIR INFLUENCE
F. Dommermuth Nov. 1984 44 p refs In GERMAN; ENGLISH summary
(Contract BMVg-GF-83/84-SuK-4.2)
(Rept-12-84; LFD-231) Copyright. Avail: Issuing Activity

The effects of a series of potential error sources on the estimation accuracy of the trajectory of an accelerationless target were investigated. The so-called retardation effect permits the estimation of all kinematic parameters from the angle measurements of a single, stationary, acoustic sensor. The investigated error sources do not allow to determine a dominating cause of

the disagreement between real and estimated trajectory parameters. Two essential error sources are the interference between the direct signal and the signal reflected by the Earth's surface, and the falsification of the angle due to a vertical wind gradient. The influence of accelerations on the estimation accuracy is determined by a simple model. The results show that a limitation of the sensor position to both horizontal microphone pairs is advantageous. Author (ESA)

N86-16040*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ANALYTICAL STUDY OF ACOUSTIC RESPONSE OF A SEMI-REVERBERANT ENCLOSURE WITH APPLICATION TO ACTIVE NOISE CONTROL
Tony L. Parrott, David B. Schein (George Washington Univ., Hampton, Va.), and Doreen Gridley (Naval Avionics Center, Indianapolis, Ind.) Dec. 1985 48 p refs
(NASA-TP-2472; L-15944; NAS 1.60:2472) Avail: NTIS HC A03/MF A01 CSCL 20A

The acoustic response of a semireverberant enclosure with two interacting, velocity-prescribed source distributions was analyzed using standard modal analysis techniques with a view toward a better understanding of active noise control. Different source and enclosure dimensions, source separations, and single-wall admittances were studied over representative frequency bandwidths of 10 Hz with source relative phase as a parameter. Results indicate that power radiated into the enclosure agree qualitatively with the spatial average of the mean square pressure, even though the reverberant field is nondiffuse. Decreases in acoustic power can therefore be used to estimate global noise reduction in a nondiffuse semireverberant environment. As might be expected, parametric studies indicate that maximum power reductions of up to 25 dB can be achieved when secondary and primary sources are compact and closely spaced. Although less success is achieved with increasing frequency and source separation or size, significant suppression of up to 8 dB still occurs over the 1 to 2 Hz bandwidth. Author

N86-16041*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LOCATION OF NOISE SOURCES USING A PHASE-SLOPE METHOD
Richard DeLoach and John S. Preisser Nov. 1985 49 p refs
(NASA-TP-2505; L-15793; NAS 1.60:2505) Avail: NTIS HC A03/MF A01 CSCL 20A

Two three-element microphone arrays have been used to predict the position of both pure-tone and broadband noise sources in an anechoic chamber under different ground impedance conditions. Source positions are predicted using the slope of phase-frequency plots between array elements. A phase-slope method for quantitatively assessing both the accuracy and precision of estimates of noise source location is introduced and illustrated. When the phase-slope method is used, there is higher accuracy and more precision in estimates of source location with a small ground impedance than with a large ground impedance. As would be expected, ground impedance effects are larger for low elevation angles than for high elevation angles. Author

N86-16042# Mississippi Univ., University. Physical Acoustics Research Lab.
A THEORETICAL INVESTIGATION OF ACOUSTIC CAVITATION
K. W. Commander and L. A. Crum 15 Jul. 1985 121 p
(Contract N00014-84-C-0193)
(AD-A158058; Rept-4-85) Avail: NTIS HC A06/MF A01 CSCL 20/1

Recent experiments have shown that when the acoustic driving frequency is near one of a bubble's harmonic resonances, the theoretical values predicted by the Rayleigh-Plesset equation are inconsistent with observed values. This inconsistency lead Prosperetti to consider the internal pressure term in the Rayleigh-Plesset equation in a more general manner. In the past the internal pressure of a bubble was assumed to be accurately predicted by a polytropic approximation. Prosperetti considered the internal pressure from the conservation equations, resulting in a much more accurate formulation. This study analyzes the two methods, showing where they agree and where they disagree. The new formulation also provides additional information about the internal thermodynamics of a bubble. Results are shown for the internal temperature of a cavitating bubble as a function of radial coordinate and time. Internal pressures for a variety of conditions are shown and are in good agreement with earlier predicted values. Different models of acoustic cavitation are examined using some of the recent techniques in dynamical systems. Feigenbaum trees were made for the two models. This method for analyzing an equation was shown to be very sensitive to the internal pressure term, and thus is an appropriate method for comparing different acoustic cavitation theories. GRA

N86-16043# Naval Postgraduate School, Monterey, Calif.
LOCALIZATION OF BURIED OBJECTS IN WATER-SATURATED SAND BY VARIABLE INCIDENCE ACOUSTIC PULSE REFLECTIONS M.S. Thesis
G. S. Bang Jun. 1985 57 p
(AD-A158064; AD-F630692) Avail: NTIS HC A04/MF A01 CSCL 17/1

The purpose of this thesis is to localize buried objects in water-saturated sand by variable incidence acoustic pulse reflections. In particular, thin aluminum plates are used to model the buried objects. The sound speed and the depth of the overlying sand layer are predicted by using the T sq minus X sq and the ray parameter methods. The experimentally computed results have an average 3.5% depth error. The calculated speed of sound in the water-saturated sand layer differed by 8.1% between the T sq minus X sq and the ray parameter methods. GRA

N86-16044# Texas Univ., Austin. Applied Research Lab.
THE EXPERIMENTAL INVESTIGATION OF THE INVERSE PROBLEM IN ROUGH SURFACE SCATTERING OF ACOUSTIC WAVES
R. S. Bailey Aug. 1985 100 p
(Contract N00014-80-C-0490)
(AD-A158070; AD-F630692; ARL-TR-85-6) Avail: NTIS HC A05/MF A01 CSCL 20/1

This study represents an inverse problems approach to rough surface acoustical scattering, the objective being to infer certain statistical characteristics of a randomly rough surface directly from the coherently scattered pressure field. Eckart's physical-acoustical scattering model is applied to derive relationships for the probability density function and correlation function of surface heights which can be inferred directly from the scattered pressure field. Signal processing techniques are used to obtain estimates of the probability density function and correlation functions from experimental data. The experimental measurements are made of the steady-state complex scattered pressure field from a single frequency small beamwidth source incident upon a pressure release model rough surface. Comparisons are made between the characteristics inferred from the scattered pressure and the actual surface characteristics. The ability of the signal processing techniques to accurately predict the known characteristics is then evaluated. GRA

N86-16045# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
CAN AIRCRAFT NOISE LESS THAN OR EQUAL 115 TO dBA ADVERSELY AFFECT REPRODUCTIVE OUTCOME IN USAF WOMEN? M.S. Thesis
P. A. Brubaker Jun. 1985 42 p
(AD-A158322; AFIT/CI/NR-85-65T) Avail: NTIS HC A03/MF A01 CSCL 06/10

It has been suggested, mainly through animal studies, that exposure to high noise levels may be associated with lower birth weight, reduced gestational length and other adverse reproductive outcomes. Few studies have been done on humans to show this association. The Air Force employs pregnant women in areas where there is a high potential for exposure to high noise levels. This study proposes a method to determine if there is an association

between high frequency noise levels > or = 115 dBA and adverse reproductive outcomes through a review of records and self-administered questionnaires in a case-comparison design. Prevalence rates will be calculated and a multiple logistic regression analysis computed for the independent variables that can affect reproduction. GRA

N86-16046# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
ULTRASONIC MEASUREMENT OF PARTICLES IN A VISCOUS FLUID M.S. Thesis
L. E. Oslund Feb. 1985 153 p
(Contract N66314-70-A-0073)
(AD-A158989) Avail: NTIS HC A08/MF A01 CSCL 17/1

A fluid model has been designed and built to simplify the more complex study of particle dispersion in polymer melts. Focussed ultrasound is employed for maximum acoustic intensity within the focal zone for high resolution of particles between the diameter ranges of 100 - 10 microns. The theory of focussed radiators is discussed with emphasis on obtaining a minimum focal zone and beam width. The parameters necessary for particle detection in a viscous fluid are highlighted. A signal processing system has been designed and implemented to allow quick, accurate, and reliable data acquisition with speeds up to 10 KHz. Incorporated in this system is the use of state-of-the-art peak detectors which gate, digitize and store, for computer pick-up, the largest signal within the gated zone. Preliminary tests have shown that glass spheres between the range of 15 - 10 microns are detectable in silicone oil. Results of these tests have been plotted, as well as results from particles in the ranges of: 25 - 15, 35 25 micron glass beads and 32 micron polystyrene beads. GRA

N86-16047# Naval Postgraduate School, Monterey, Calif.
OPTIMUM FREQUENCY FOR PROPAGATION OF SOUND IN SHALLOW SOUND CHANNELS M.S. Thesis
W. L. Bradfield-Smith Jun. 1985 107 p
(AD-A159064) Avail: NTIS HC A06/MF A01 CSCL 20/1

Optimum frequency for propagation of sound in shallow sound channels was studied using two acoustic transmission loss models. The split-step Parabolic Equation model (a full-wave model) and the Fast Asymptotic Coherent Transmission loss model - version 9H (a ray-tracing model) - were tested against experimental data collected by Dosso and Chapman in the northeast Pacific Ocean. The models were found to be valid predictors of optimum frequency for the shallow sound channel observed by Dosso and Chapman. Both models were then used to predict optimum frequency for two sound velocity profiles obtained in a high-latitude deep ocean basin under summer conditions, exhibiting shallow sound channels. As expected, the split-step Parabolic Equation (PE) model adequately predicted optimum frequencies for these cases. The Fast Asymptotic Coherent Transmission loss model, version 9H (FACT 9H) model did not produce reasonable results for optimum frequencies. GRA

N86-16048# Texas Univ., Austin. Applied Research Lab.
THE BROADBAND NORMAL MODE MODEL PROTEUS
R. F. Gragg 1 Aug. 1985 28 p
(Contract N00014-83-K-0346)
(AD-A159091; ARL-TM-85-6) Avail: NTIS HC A03/MF A01 CSCL 20/1

The contractor, ARL: U Tex, developed the mormal mode model PROTEUS for use in analyzing ocean acoustic data. The model and its postprocessors simulate broadband propagation in range invariant environments. A wave theoretical appraoch was chosen to allow operation at low frequency in shallow water (< or approx. = 200 Hz, < or approx. = 300 M), where X ray theory may not be applicable, PROTEUS is a multifrequency extension, based on the original ARL: U Tex single frequency normal mode model NEMESIS in order to limit software development time while producing a reliable program with a familiar user interface. This report describes the foundations of the PROTEUS computer program and presents sample output products. The PROTEUS calculates a broadband set of normal modes for range invariant environments. Detection of a low frequency broadband sound source in shallow water has become a significant problem in underwater acoustics. Assessment of the environment's impact on such detection requires (in addition to a specification of the source and a choice of detection algorithm) some means of modeling the signal propagation. A wave theory propagation model such as a normal model is needed. At ranges of interest (> or approx. = 5 water depths) continuous spectrum contributions are nil, and the acoustic field can be constructed solely from the discrete modes. GRA

N86-16049# Aeronautical Research Labs., Melbourne (Australia).
ULTRASONIC TRANSIT TIME MEASUREMENTS USING FAST ANALOG TO DIGITAL CONVERSION AND A FAST FOURIER TRANSFORM BASED ALGORITHM
S. J. Rumble and J. G. Sparrow Mar. 1985 27 p
(AD-A159426; ARL-STRUC-TM-406) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper describes the application of a fast (100MHz) analog to digital voltage converter and a discrete fast Fourier transform based algorithm to the determination of ultrasonic transit times. The precision obtained was typically better than 1 nanosecond. Transit times over a range of frequencies (2-7MHz) have been measured using a broadband transducer excited by a chopped CW RF pulse. The frequencies chosen corresponded to those available from the discrete fast Fourier transform. Documented listings of the programs used are provided. GRA

N86-16050# Flow Research, Inc., Kent, Wash.
ARCTIC OCEAN BACKGROUND NOISE CAUSED BY RIDGING OF SEA ICE Final Report, 1 Oct. 1981 - 30 Sep. 1982
R. S. Pritchard Jul. 1983 40 p
(Contract N00014-82-C-0002; RR0-3205)
(AD-A159587; TR-266/07-83) Avail: NTIS HC A03/MF A01 CSCL 20/1

A new method is presented to explain how noise is generated under pack ice by ridging of the pack ice. The energy dissipated during the ridging process is assumed to be the proper measure of the noise source level. Noise source levels generated by ridging are simulated. Noise intensity at a specific site is calculated by summing signals from all these sources after accounting for propagation losses. Calculations are made to compare this simulated noise with observations for an experiment conducted during the winter of 1975 to 1976 in the Beaufort Sea. During a 120-day period, 46% of the intensity of the noise signal is explained using this process, and over several 20-day periods, in excess of 64% is explained. In addition to explaining a significant amount of energy and ambient noise, the model is attractive on physical grounds and properly explains lack of noise when winds are high but ice is strong enough to resist ridging. GRA

N86-16051# Ames Lab., Iowa.
ULTRASONIC CHARACTERIZATION OF POROSITY USING THE KRAMERS-KRONIG RELATIONS
J. H. Rose, D. K. Hsu, and L. Adler 1985 4 p Presented at the Conference on Internal Friction and Ultrasonic Attenuation In Solids, Urbana, Ill., 3 Jun. 1985 Prepared in cooperation with Ohio State Univ., Columbus
(Contract W-7405-eng-82)
(DE85-017346; IS-M-561; CONF-8506125-7) Avail: NTIS HC A02/HC A01

A new algorithm is proposed to determine the volume fraction of pores in solids using the frequency dependent ultrasonic attenuation. The algorithm was developed by examining the Kramers-Kronig relation between the porosity induced ultrasonic attenuation and the change in sound velocity. The method is tested using data measured for several porous aluminum samples. DOE

N86-16052# Naval Ship Research and Development Center, Bethesda, Md.
AN ALGORITHM FOR ACTIVE ADAPTIVE CONTROL OF PERIODIC INTERFERENCE Final Report
R. D. Pierce May 1985 34 p

(AD-A156651; DTNSRDC-85/047) Avail: NTIS HC A03/MF A01 CSCL 12/1

An algorithm is presented for the active adaptive control of periodic interference. This algorithm is derived, its performance is theoretically analyzed, and the algorithm and its performance are verified by laboratory experiments. In these experiments, this control method is shown to reduce the periodic components by more than 40 dB. GRA

N86-16053# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abt. Turbulenzforschung.

ON SECOND PROPAGATION IN RADIAL FAN CASINGS

Manfred Bartenwerfer and Teofani Gikadi (Technical Univ., Berlin) Feb. 1985 34 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-957)

(DFVLR-FB-85-32; ISSN-0171-1342) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 11

Sound propagation in radial fan hollow casings was studied for cylindrical and spiral-shaped casings of the same volume and width. After measurement of the sound reflection through the different casings a monopole or dipole sound source of reduced expansion at the casing cut-off was introduced and the frequency responses in the intake and outflow canals determined. The influence of casing geometry and the flow in the casing on the rejection level and on the system frequency responses was determined. The applicability of the one-mode approximation for description of the frequency responses was verified. Torsional sound in the outflow canal can be reduced with a phase-variable sound source synchronous with the rotation frequency at the cut-off. Author (ESA)

N86-15621# Joint Publications Research Service, Arlington, Va.

EXPERIMENTAL INVESTIGATION OF ACOUSTIC WAVE ELECTRICAL EXCITATION IN ELECTROLYTE SOLUTION Abstract Only

A. N. Malakhov and V. V. Cherepennikov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 73 Transl. into ENGLISH from izvestiya Vysshikh Uchebnykh Zavedeniy: Radiofizika (Gorkiy, USSR), v. 27, no. 10, Oct. 1984 p 1349-1352 (For primary document see N86-15561 06-33)

Avail: NTIS HC A05/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N86-16054*# Institute for Scientific Research, Stoneham, Mass.

MOLECULAR PROCESSES IN A HIGH TEMPERATURE SHOCK LAYER Semiannual Status Report, 1 May - 31 Oct. 1985

Steven L. Guberman [1985] 22 p refs

(Contract NCC2-308)

(NASA-CR-176357; NAS 1.26:176357; SASR-3) Avail: NTIS HC A02/MF A01 CSCL 20H

The development of techniques for the calculation of electron capture widths, electronic wave functions, cross sections and rates needed for the description of the dissociative recombination (DR) of molecular ions with electrons were described. The cross sections and rates were calculated by using harmonic oscillator wave functions for the ion and a delta function approximation for the continuum vibrational wave function in the repulsive dissociative channel. In order to obtain DR cross sections of quantitative accuracy, a computer program which solves the one dimensional nuclear motion wave equation was revised to calculate the cross sections and rates. The program and the new results are described. Included is a discussion of large windows found in the dissociative recombination cross sections from excited ion vibrational levels. These windows have not been previously reported in the literature. The magnitude of the DR cross sections for several dissociative routes are sensitive to the location of the crossing of the neutral and ion potential curves. Studies of the effects of basis set and CI wave function size on vertical excitation energies are described. Preliminary studies on N2 and O2 using large scale wave functions are also reported. G.L.C.

N86-16055# Berkeley Research Associates, Inc., Calif.

RESEARCH ON INTENSE ELECTRON BEAMS AND APPLICATIONS Final Report, 1 May 1983 - 30 Apr. 1984

Jul. 1984 89 p

(Contract N00014-83-C-2157)

(AD-A158234; PD-BRA-84-317R) Avail: NTIS HC A05/MF A01 CSCL 20/7

During this period, an extensive investigation of electron beam stability was carried out in the context of an easily formulated 2-D cold electron layer model. This work was carried on in close association with NRL personnel in conjunction with the special focus program, Advanced Accelerators. The modified betatron has been the subject of an intense investigation by NRL staff as a potential high current electron accelerator. Significant progress has been made in the understanding of the operation of this device and a large experimental effort designed to test this understanding is now well underway. Much of the work to date has been directed toward a formulation of the in situ beam dynamics, involving equilibrium and stability considerations, while other research has been directed toward solving the difficult injection problem. Once an equilibrium is established, which in general requires constraints on beam density and on the betatron field index, stability questions of two general types arise. GRA

N86-16056# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.

THE PARAMETERS OF ADIABATIC RAPID PASSAGE IN THE 0-0 HYPERFINE TRANSITION OF Rb-87

J. C. Camparo and R. P. Frueholz 24 Jun. 1985 44 p

(Contract F04701-83-C-0084)

(AD-A158562; TR-0084A(5945-05)-4; SD-TR-85-20) Avail: NTIS HC A03/MF A01 CSCL 20/8

When an electromagnetic field, coupling two levels of an atomic or molecular system, has its frequency swept across resonance, population reversal can occur as a result of the coherent transient phenomenon known as adiabatic rapid passage (ARP). For this phenomenon to occur, the frequency sweep rate is required to be rapid with respect to the relaxation processes occuring in the system, and at the same time slow enough so that the system can follow the frequency sweep adiabatically. The present investigations treat ARP in the 87Rb hyperfine transition, where optical pumping produces a population imbalance in the ground-state hyperfine levels, and where the influence of a microwave frequency swept across the hyperfine resonance is monitored by the transmitted intensity of the optical pumping laser. These parameters relate to how adiabatic and how rapid the passage through resonance must be in order to maximize the degree of population reversal. We find both experimentally and theoretically that the adiabaticity requirement is rather weak, and that once satisfied, it is more important to pass through the resonance rapidly. Furthermore, interpreting our results in the Bloch vector model f ARP, we find that the Block vector is only required to precess a half revolution about the effective field in order to follow a 90 degree change in the direction of that field. The applicability of the present results of ARP in general is discussed. GRA

N86-16057# Naval Postgraduate School, Monterey, Calif.

OBSERVATION OF MICROWAVE CERENKOV RADIATION AS DIFFRACTION PATTERN Technical Report

X. R. Maruyama, J. R. Neighbours, F. R. Buskirk, D. D. Snyder, and M. Vujaklija 1 Aug. 1985 21 p

(AD-A159337; NPS61-85-006) Avail: NTIS HC A02/MF A01 CSCL 20/7

Measurement of microwave Cerenkov radiation in air exhibits the diffraction pattern predicted in earlier work. The radiation appears only at harmonics of the frequency of periodic electron bunches. Angular distribution power measurements are presented for frequencies of 2.86, 5.71, 8.57 and 11 and 12 GHz corre-

sponding to the fundamental and the first three harmonics of an S band RF linac. GRA

N86-16058# Aerospace Corp., El Segundo, Calif. Defense Development Div.
MATERIAL SHIELDS AGAINST NEUTRAL ATOMIC PARTICLE BEAMS
S. W. Kash 12 Jul. 1985 24 p
(Contract F04701-83-C-0084)
(AD-A159445; TR-0084A(5435-04)-1; SD-TR-85-46) Avail: NTIS HC A02/MF A01 CSCL 18/6

A material shield designed to protect a spacecraft against an atomic particle beam will, of necessity, be quite massive; consequently, even modest fractional-weight savings would be significant. With this goal in mind, the particle stopping power and range in various materials were investigated. The lightest shield materials are compounds composed of hydrogen and other light elements. GRA

N86-16059# Lawrence Livermore National Lab., Calif.
COLLECTIVE ACCELERATOR FOR ELECTRON COLLIDERS
R. J. Briggs 13 May 1985 5 p Presented at the Particle Accelerator Conference, Vancouver, Canada, 13 May 1985
(Contract W-7405-eng-48)
(DE85-012878; UCRL-92673; CONF-850504-88) Avail: NTIS HC A02/MF A01

A recent concept for collective acceleration and focusing of a high energy electron bunch is discussed, in the content of its possible applicability to large linear colliders in the TeV range. The scheme can be considered to be a member of the general class of two-beam accelerators, where a high current, low voltage beam produces the acceleration fields for a trailing high energy bunch. DOE

N86-16060# AMAF Industries, Columbia, Md.
RESEARCH AND DEVELOPMENT OF AN AIMED MAGNETIC LEAD CURRENT DENSITY-MAGNETIC FIELD DIAGNOSTIC Final Report
[1985] 76 p
(DE85-014720; DOE/ER-53105/T2) Avail: NTIS HC A05/MF A01

This section of the report presents a diagnostics survey of sufficient quality to provide a clear definition of advanced diagnostic needs and the limitations of current approaches in addressing those needs. Special attention was given to the adequacy with which current diagnostics are interfaced to signal processing/data acquisition devices and systems. Critical evaluation of selected alternative diagnostic techniques for future R&D activities shall be presented. DOE

N86-16061# Lawrence Livermore National Lab., Calif.
TABLES OF MASSES, BINDING ENERGIES, HALF-LIVES AND NATURAL ABUNDANCES
R. J. Howerton 16 Jul. 1985 58 p
(Contract W-7405-eng-48)
(DE85-016344; UCID-20487) Avail: NTIS HC A04/MF A01

Tables of masses, binding energies and half-lives of the isotopes, and natural abundances and masses of the elements are presented. The masses and binding energies are taken from the 1977 Wapstra and Bos atomic mass tables. The half-lives and natural abundances are from the seventh edition of the Table of Isotopes. DOE

N86-16062# Oak Ridge National Lab., Tenn.
IMPROVING NEUTRON REACTION DATA THROUGH LINAC-BASED FLIGHT-TIME SPECTROMETRY
R. W. Peelle 1985 8 p Presented at the Annual Meeting of the American Nuclear Society, Boston, Mass., 9 Jun. 1985
(Contract DE-AC05-84OR-21400)
(DE85-016417; CONF-850610-38) Avail: NTIS HC A02/MF A01

Pulsed neutron facilities based on electron linear accelerators (linacs) allow measurements of neutron cross sections from E sub n approx. 0.01 eV to e sub n > 20 MeV. This paper outlines the capabilities of such facilities and their role in upgrading the neutron cross-section data base. DOE

N86-16063# Oak Ridge National Lab., Tenn.
INTENSE e-BEAM INTERACTION WITH MATTER
R. H. Ritchie and O. H. Crawford 1984 19 p Presented at Navy CPB Materials Interaction Workshop, Silver Spring, Md., 24 Sep. 1984
(DE-AC05-84OR-21400)
(DE85-017093; CONF-8409264-1) Avail: NTIS HC A02/MF A01

This document describes work done in this period on certain nonlinear processes of potential importance at high energy densities in condensed matter, and on the theory of the electron slowing-down-cascade spectrum engendered in solids by e-beams. DOE

N86-16064# Lawrence Livermore National Lab., Calif.
MBE-4, A HEAVY ION MULTIPLE-BEAM EXPERIMENT
R. T. Avery, C. S. Chavis, T. J. Fessenden, D. E. Gough, T. F. Henderson, D. Keefe, J. R. Meneghetti, C. D. Pike, D. L. Vanecek, and A. I. Warwick May 1985 6 p refs Presented at the Particle Accelerator Conference, Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00098)
(DE85-016626; LBL-19620; CONF-850504-261) Avail: NTIS HC A02/MF A01

MBE-4, a heavy-ion multiple beam induction linac being built at LBL in FY85/86, will model many features of a much longer device. It will accelerate four space-charge-dominated cesium ion beams from, for example, 0.2 MeV, 5 mA/beam, 3.0 (MU)sec, 1.6 m length at injection to approx.0.8 MeV, 15 mA/beam, 1.0 (MU)sec, 1.1 m length at the exit. It will permit study of simultaneous focussing, acceleration, current amplification and emittance growth of multiple space-charge-dominated ion beams. Some features of this accelerator are described. DOE

N86-16065*# Los Alamos National Lab., N. Mex.
SUMMARY FROM WORKING GROUP ON MULTIPLE BEAMS AND FUNNELING
T. P. Wangler 1985 7 p Presented at the Workshop on High Brightness, High Current, High Duty Factor Ion Injectors, San Diego, Calif., 21 May 1985
(Contract W-7405-eng-36)
(DE85-015694; LA-UR-85-2556; CONF-8505164-6) Avail: NTIS HC A02/MF A01

The working group on Multiple Beams and Funneling discussed various topics related to multiple beams and funneling, including (1) design considerations for multiple-beam accelerators; (2) scaling of current, emittance, and brightness for multiple-beam systems; (3) funneling lines using either discrete components or a radiofrequency quadrupole (RFQ) funneling structure; and (4) alternatives to funneling. DOE

N86-16066# California Univ., Berkeley. Lawrence Berkeley Lab.
FRICTION IN NUCLEAR DYNAMICS
W. J. Swiatecki Mar. 1985 36 p refs Presented at the Symposium on Semiclassical Descriptions of Atomic and Nuclear Collisions, Copenhagen, Denmark, 25 Mar. 1985
(Contract DE-AC03-76SF-00098)
(DE85-011984; LBL-19222; CONF-850376-2) Avail: NTIS HC A03/MF A01

The problem of dissipation in nuclear dynamics is related to the breaking down of nuclear symmetries and the transition from ordered to chaotic nucleonic motions. In the two extreme idealizations of the perfectly Ordered Regime and the fully Chaotic Regime, the nucleus should behave as an elastic solid or an overdamped fluid, respectively. In the intermediate regime a complicated visco-elastic behavior is expected. The discussion is illustrated by a simple estimate of the frequency of the giant quadrupole resonance in the Ordered Regime and by applications of the wall and window dissipation formulae in the Chaotic Regime. DOE

N86-16067# Sandia National Labs., Albuquerque, N. Mex.
IFA-2 COLLECTIVE ION ACCELERATOR EXPERIMENTS
C. L. Olson, C. A. Frost, E. L. Patterson, J. P. Anthes, and J. W. Poukey 1985 16 p refs Presented at the Particle Accelerator Conference, Vancouver, British Columbia, 13 May 1985
(Contract DE-AC04-76DP-00789)
(DE85-012358; SAND-85-0035C; CONF-850504-44) Avail: NTIS HC A02/MF A01

Ion acceleration has now been demonstrated with the IFA-2 collective ion accelerator system. The IFA-2 system is described, photoionization experiments are summarized, and ion results are presented. Using a 1 MeV electron beam and a 30 cm acceleration length, IFA-2 has produced 5 MeV H(+), 10 MeV D(+), and 20 MeV He(++). This means that accelerating fields of 33 MV/m over 30 cm have been achieved with a controlled collective accelerator for the first time. DOE

N86-16068# Defense Nuclear Agency, Washington, D.C.
SIGNIFICANCE OF SINGLE PARTICLE EFFECTS IN NEUTRAL BEAM WEAPON LETHALITY
B. Steverding and J. S. Browning 1985 2 p Presented at the Heart Conference, Monterey, Calif., 25 Jul. 1985 Prepared in cooperation with Sandia Labs., Albuquerque, New Mexico
(Contract DE-AC04-76DP-00789)
(DE85-012031; SAND-85-1139C; CONF-850756-2) Avail: NTIS HC A02/MF A01

This paper provides a rationale for assessing the response of microelectronics to single event effects caused by directed energy weapons utilizing beams of neutral particles. The current understanding of single particle vulnerabilities is summarized, and an extrapolation of these vulnerabilities outside of the experimental domain is presented. DOE

N86-16069# California Univ., Berkeley. Lawrence Berkeley Lab.
GGLP EFFECT FROM 1959 TO 1984
G. Goldhaber Apr. 1985 30 p refs Presented at the Local Equilibrium in Strong Interactions Phys. Meeting, Bad Honnef, West Germany, 1 Sep. 1894
(Contract DE-AC03-76SF-00098)
(DE85-011981; LBL-19417; CONF-8409204-3) Avail: NTIS HC A03/MF A01

The GGLP effect refers to the difference in opening angles of pion pairs for like and unlike pairs. This was found to be the effect of Bose-Einstein statistics for pions. The discovery of the effect in 1959, its interpretation in terms of Bose-Einstein statistics, and the use of the effect in pion interferometry are reviewed. DOE

N86-16070# Carnegie-Mellon Univ., Pittsburgh, Pa.
SEARCH FOR THE XI(2220) AT LEAR
D. W. Hertzog, P. D. Barnes, G. E. Diebold, G. Franklin, C. Maher, B. Quinn, J. Seydoux, J. Szymanski, K. Kilian, R. Besold et al 1985 6 p refs Presented at the International Conference on Hadron Spectroscopy, College Park, Md., Apr. 1985 Prepared in cooperation with European Organization for Nuclear Research, Geneva, Switzerland, ErlangenNuremberg Univ., West Germany, Freiburg Univ., West Germany, Illinois Univ., Champaign, Rice Univ., Houston, Tex., Commissariat a l'Energie Atomique, Gif-sur-Yvette, France, Uppsala Univ., Sweden and OEAW, Vienne, Austria
(DE85-014329; DOE/ER-03244/114; CONF-8504133-5) Avail: NTIS HC A02/MF A01

Since the revelation of the narrow resonance at 2220 MeV in the K anti K final states of the radiative decay J/Psi-deltaX at SLAC, much theoretical and experimental effort has been devoted to the understanding of this unusual object. Theoretical explanations range from the conventional to the exotic. The experimental evidence, however, rests solely on one experiment and is not of sufficient quality to distinguish among the intriguing possibilities. We describe an experiment which would be ideal to measure precisely the properties of the xi, including its mass, width, and angular momentum. DOE

N86-16071# Rome Univ. (Italy). Dipt. di Fisica.
DOES ONE NEED A FOURTH GENERATION OF LEPTONS
Maurizio Lusignoli 16 May 1985 13 p refs
(Preprint-461) Avail: NTIS HC A02/MF A01

It is argued that massive neutrinos with masses 0(eV) and 0(KeV) can be naturally incorporated in the standard model with only left-handed neutrinos by assuming the existence of a fourth lepton family and of an approximate global symmetry that keeps the neutrino masses almost degenerate in pairs. Besides the existence of a new heavy charged lepton, the model gives interesting predictions for neutrino experiments at accelerators and underground. Author (ESA)

N86-16072# Rome Univ. (Italy). Dipt. di Fisica.
NUCLEON STRUCTURE FUNCTIONS FROM NEUTRINO SCATTERING
M. Diemoz, F. Ferroni, and E. Longo 15 May 1985 119 p refs Submitted for publication
(Nota-Interna-851) Avail: NTIS HC A06/MF A01

Experimentation using neutrino probes to discriminate between quarks and antiquarks is reviewed. Beams, detectors, and data reduction are described. Extraction of structure functions from the data, including approximations and corrections involved, is outlined. Results on the structure functions are presented, and compared with charged lepton-production results, particularly the so-called EMC effect. Interpretation of experimental results in the framework of QCD is examined. The parametrization of the behavior of structure functions as determined by neutrino experiments for comparison with other experimental sources of information on the nucleon structure is summarized. Author (ESA)

N86-15590# Joint Publications Research Service, Arlington, Va.
INTRINSIC MAGNETIC FIELD OF ELECTRON BEAM Abstract Only
M. P. Zaft and S. I. Molokovskiy *In* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 41-42 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 9, Sep. 1984 p 1845-1848 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15591# Joint Publications Research Service, Arlington, Va.
STIMULATED EMISSION OF BOUNDED STRONG-CURRENT ELECTRON BEAM WITH LONGITUDINAL MAGNETIC FIELD MAGNETOSTATIC PUMPING Abstract Only
V. P. Grigoryev *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 42 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 10, Oct. 1984 p 1977-1984 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15592# Joint Publications Research Service, Arlington, Va.
TUBULAR STRONG-CURRENT RELATIVISTIC ELECTRON BEAM INSTABILITY Abstract Only
O. B. Ovsyannikova, F. F. Kamenets, and V. G. Leyman *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 43 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 10, Oct. 1984 p 1985-1993 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15593# Joint Publications Research Service, Arlington, Va.
FASTER-THAN-LIGHT SOURCES IN ELECTRON BEAMS Abstract Only
B. G. Tsikin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 43 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 10, Oct. 1984 p 1994-1997 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N86-16073# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
IN SEARCH OF HIGH J STATES IN THE HF(v, J) SYSTEM
M. A. Kwok, R. L. Wilkins, G. I. Segal, E. F. Cross, and R. H. Ueunten 14 Jun. 1985 54 p
(Contract F04701-83-C-0084)
(AD-A158937; TR-0084A(5603)-2; SD-TR-85-21) Avail: NTIS HC A04/MF A01 CSCL 07/4

Populations in high rotational states of HF far from rotational-translational equilibrium have been observed in reactive fast flows in a large diameter flow tube. The high rotational states are assumed to be produced from the chemically generated, vibrationally excited HF(v, J) by direct V yields R intramolecular energy transfer collisions with ground-state H2, HF, or Ar species. In a chemical kinetic analysis it is shown that the results are consistent with the multiquantum V yields R energy-transfer mechanism for HF(v, J) + M proposed by R. L. Wilkins for HF(v, J) + HF and D. L. Thompson for HF(v, J) + Ar. Experimental studies are made by monitoring HF R-R spectral emissions between 9 to 22 micrometer with a sensitive bolometer. Author (GRA)

N86-16074# Chicago Univ., Ill.
TOPICS IN THEORETICAL PHYSICS Progress Report
1985 7 p refs
(Contract DE-FG02-84ER-45144)
(DE85-016734; DOE/ER-5144/T1) Avail: NTIS HC A02/MF A01

Progress is reported in these areas: supersymmetry and conformal invariance and new structures in two dimensional critical phenomena; spinor fields and new applications and techniques for studying Ising model correlation factors; superstring compactification and high energy physics applications for novel two dimensional critical points; ordered and disordered spatial structure in dynamical systems; and fermion-boson mass relations in BCS type theories. Research is proposed in covariant formulation of the superstring, topics in superconformal field theory and new structures in two dimensional critical phenomena, ordered and disordered spatial structure in dynamical systems, and field theory over Galois fields. DOE

N86-16075# Pacific Northwest Lab., Richland, Wash.
RADIATION EFFECTS IN ACTINIDE HOST PHASES
W. J. Weber and H. Matzke May 1985 15 p refs Presented at the International Conference on Radiation Effects in Insulators, Guildford, England, 15 Jul. 1985 Prepared in cooperation with Commission of the European Communities, Karlsruhe, West Germany
(Contract DE-AC06-76RL-01830)
(DE85-016273; PNL-SA-13093; CONF-850781-1) Avail: NTIS HC A02/MF A01

Three crystalline ceramic materials, which occur as host phases for the long-lived actinides in many nuclear waste formulations, were doped with Cm-244, and the effects of self-radiation damage from alpha decay on microstructure and physical properties were investigated. The irradiation-induced microstructure consisted of individual amorphous tracks from both the alpha-recoil particles and the spontaneous fission fragments. The eventual overlap of the tracks at higher doses leads to a completed amorphous state. This radiation-induced amorphization process results in a stored energy of approx. 125 J/g, 5 to 10% swelling, factor of 10 to 50 increase in leachability (aqueous dissolution), and in increase in fracture toughness. DOE

N86-16076# Lawrence Livermore National Lab., Calif.
RADIONUCLIDE MIGRATION PROJECT 1984 Progress Report
R. W. Buddemeier, comp. and D. Isherwood, comp. Apr. 1985 74 p
(Contract W-7405-eng-48)
(DE85-017383; UCRL-53628) Avail: NTIS HC A04/MF A01

The report discusses the hydrogeologic settings and histories of studies associated with the Cheshire (U20n), Cambric (U5e), Nash (UE2ce), Bilby (U3cn), Bourbon (U7n), and Faultless (UC1) Events. Radionuclide and some chemical data are presented for water samples from cavity or chimney wells associated with the Cheshire, Cambric, and Bilby Events, and from satellite wells at the Cambric, Nash, Bibly, Bourbon, and Faultless Event sites. The report also gives the results of studies of specific sampling or analytical methodologies. These studies demonstrated that the apparent migration of (155)Eu is an artfact of spectrometric misidentification of gamma- and X-ray peaks from other constituents. A potential problem with atmospheric contamination of samples collected with evacuated thief samples was also identified. Ultrafiltration techniques were applied to some of the Cheshire cavity samples collected, and preliminary results suggest that substantial amounts of activity may be associated with colloidal particles in the size range of 0.006 to 0.45 (MU)m. A study has begun of the recharge of effluent water from RNM-25 (Cambric satellite well) into the desert floor as a result of nine years of continuous pumping. This report gives the initial results of unsaturated zone studies showing the propagation of moisture and tritium fronts through the shallow soil. Geochemical modeling of the behavior of ruthenium and technetium was carried out, with particular emphasis on the identification of ionic species that would be potentially mobile under NTS ground-water conditions. The report compares the results with observations of ruthenium migration to the Cambric satellite well. DOE

N86-16077# Fermi National Accelerator Lab., Batavia, Ill.
TOM: A PROGRAM FOR INTERACTIVE LATTICE DESIGN
R. P. Johnson and F. Willeke Jun. 1985 4 p Presented at the Particle Accelerator Conference, Vancouver, British Columbia, 13 May 1985 Prepared in cooperation with Deutches Elektronen-Synchrotron, Hamburg, West Germany
(Contract DE-AC02-76CH-03000)
(DE85-016988; FNAL-TM-1331; CONF-850504-248) Avail: NTIS HC A02/MF A01

An interactive program to help design accelerator lattices and lattice insertions is described. Present limitations and directions of future development are indicated. DOE

N86-16078# Fermi National Accelerator Lab., Batavia, Ill.
PULSED SEPTUM MAGNET FOR THE FERMILAB ANTIPROTON SOURCE
J. A. Satti and S. D. Holmes Jun. 1985 4 p Presented at the Particle Accelerator Conference, Vancouver, British Columbia, 13 May 1985
(Contract DE-AC02-76CH-03000)
(DE85-016993; FNAL-TM-1321; CONF-850504-259) Avail: NTIS HC A02/MF A01

A 2 meter curved pulsed septum magnet for use in the Fermilab Antiproton Source is described. The magnet produces a peak field of 6 kGauss at a current of 20,000 Amperes within a 0.4 msec long pulse. The field uniformity obtained is DELTA B/B $<$ 0.2% out to 3.8 cm from the copper septum. Power enters the magnet from the center resulting in very simple ends and the magnet incorporates at 0.5 cm steel guard which reduces the field to $<$ 1.4 Gauss in the zero-field region. The total septum thickness is 1.3 cm. The vacuum enclosure doubles as the stacking fixture for the magnet laminations allowing easy assembly of a magnetic with a 50 m radius of curvature. DOE

N86-16079# Fermi National Accelerator Lab., Batavia, Ill.
MEASURING THE ORBIT LENGTH OF THE TEVATRON
C. Kerns, Q. Kerns, and H. Miller Jun. 1985 4 p refs Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC02-76CH-03000)

(DE85-017443; FNAL-TM-1330; CONF-850504-268) Avail: NTIS HC A02/MF A01

The orbit length in the Tevatron was measured when coasting beam was first obtained. The method was time-of-flight, using a vernier phase comparison between beam pickup signals and a synthesizer sine wave. Some effort was spent making a stable phase detector so that it would not be a limiting factor. The results exhibited a repeatability of a few Hz at 53 MHz, corresponding to a mean radius measurement to 0.1 mm. DOE

N86-16080# Oak Ridge National Lab., Tenn.
SELF-CONSISTENT ELECTRONIC STRUCTURE OF ALPHA-PHASE HUME-ROTHERY ELECTRON COMPOUND
G. M. Stocks and A. M. Boring 1985 22 p Prepared in cooperation with Los Alamos National Lab., New Mexico, Tennessee Univ., Knoxville, Cincinnati Univ., Ohio and Bristol Univ., England
(Contract DE-AC05-84OR-21400)
(DE85-017560; LA-UR-85-2061) Avail: NTIS HC A02/MF A01

We have performed charge self-consistent electronic structure calculations for the (alpha)-phase Hume-Rothery electron compound alloys Cu sib c Zn sub 1-c, Cu/sub c/Ga/sub -1c, and Cu sub c Ge sub 1-c having electron to atom ratios 1: 1, 1:2, and 1:3 for each alloy series. The calculations are based on the self-consistent-field Korringa-Kohn-Rostoker coherent-potential approximation (KKR-CPA). We show results for the densities of states and Fermi surface of these alloys; the behavior of these quantitites is quite different from that predicted on the basis of the rigid band model. We also show results for the ground state properties of the Cu sub c Zn sub 1-c alloys that were obtained on the basis of a recent generalization of the density functional theory to random alloys. The theory provides a basis for understanding the concentration variation of the lattice parameter (Vegards' Law) of Cu sub c Zn sub 1-c alloys at the microscopic quantum mechanical level. DOE

N86-16081# Argonne National Lab., Ill.
SUPERCONDUCTING LINACS: SOME RECENT DEVELOPMENTS
L. M. Bollinger 1985 38 p refs Presented at the 4th International Conference on Electrostatic Accelerator Technology and Associated Boosters, Buenos Aires, Argentina, 15 Apr. 1985
(Contract W-31-109-eng-38)
(DE85-014972; CONF-850470-7) Avail: NTIS HC A03/MF A01

The paper is a review of superconducting linacs that are of interest for heavy-ion acceleration. Most of the paper is concerned with energy boosters or projectiles from tandem electrostatic accelerators, the only application for which superconducting linacs are now used for heavy-ion acceleration. There is also a brief discussion of the concept of a superconducting injector linac being developed as a replacement of the tandem in a multi-stage acceleration system. Throughout, the emphasis is on the technology of the superconducting linac, including some attention to the relationships between resonator design parameters and accelerator performance characteristics. DOE

N86-16082# Stanford Linear Accelerator Center, Calif.
COMPUTATIONAL NEEDS FOR MODELLING ACCELERATOR COMPONENTS
H. Hanerfeld Jun. 1985 4 p refs Presented at the Conference on Computing in High Energy Physics, Amsterdam, Netherlands, 25 Jun. 1985
(Contract DE-AC03-76SF-00515)
(DE85-015262; SU-SLAC-PUB-3708; CONF-8506157-1) Avail: NTIS HC A02/MF A01

The particle-in-cell MASK is being used to model several different electron accelerator components. These studies are being used both to design new devices and to understand particle behavior within existing structures. Studies include the injector for the Stanford Linear Collider and the 50 megawatt klystron currently being built at SLAC. MASK is a 2D electromagnetic code which is being used by SLAC both on our own IBM 3081 and on the CRAY X-MP at the NMFECC. Our experience with running MASK illustrates the need or supercomputers to continue work of the kind described. DOE

N86-16083# Mound Lab., Miamisburg, Ohio.
DEMONSTRATION OF THE IN-FIELD USE OF CALORIMETRIC ASSAY FOR IAEA INSPECTION PURPOSES
W. W. Strohm, S. Fiarman, and R. B. Perry 1985 5 p refs Presented at the 26th Annual Meeting of the Institute of Materials Management, Albuquerque, New Mexico, 21 Jul. 1985 Prepared in cooperation with Argonne National Lab., Ill. and International Atomic Energy Agency, Vienna
(DE85-016448; MLM-3278(OP); CONF-850765-25) Avail: NTIS HC A02/MF A01

The second physical inventory verification (PIV) exercise for IAEA inspectors was conducted at a US MOX fabrication facility (WHC) under the auspices of BNL/ISPO in 1984. The IAEA bulk calorimeter was introduced into this exercise. Completely non-destructive calorimetric assay was performed using gamma-ray isotopic measurements. The calorimetric assay measurements on selected items from several strata were used to generate HLNC calibration curves completely independent of operator's values. Outliers from HLNC measurements were also measured by calorimetric assay to demonstrate an in-field alternative to withdrawing aliquots for chemical assay. This exercise demonstrated that the IAEA now has the capability of applying calorimetric assay for these purposes. DOE

N86-16084# Department of Energy, Washington, D. C. Office of Health and Environmental Research.
WORKSHOP ON RADIOBIOLOGICAL EFFECTIVENESS OF NEUTRONS
G. E. Stapleton, R. G. Thomas, and J. W. Thiessen Sep. 1985 36 p refs Workshop held at Germantown, Maryland, 9 Apr. 1985
(DE85-017577; CONF-8504162) Avail: NTIS HC A03/HC A01

The radiobiological effectiveness (RBE) of neutrons has become the subject of some heated discussions in both scientific and radiation-protection oriented communities. This has become especially so since the realization that neutron exposures of A-bomb survivors in Hiroshima were considerably lower than previously assumed, thus devaluating the importance of what we thought was a solid human data base. At the same time, more recent data from radiobiological research appeared to indicate that, at least for some biological endpoints, the RBE of neutrons at low doses and low dose rates was increased dramatically compared to the RBE at higher dose and dose rates. As a consequence, the protection of health against neutrons became a subject of some urgency. The objective of this workshop was to evaluate the existing data base in order to determine the need for additional research in this field. DOE

N86-16085# California Univ., Berkeley. Lawrence Berkeley Lab.
TRANSPORTABLE CHARGE IN A PERIODIC ALTERNATING GRADIENT SYSTEM
E. P. Lee, T. J. Fessenden, and L. J. Laslett May 1985 6 p refs
(Contract DE-AC03-76SF-00098)
(DE85-015664; LBL-19798; HIFAN-225) Avail: NTIS HC A02/MF A01

A simple set of formulas is derived which relate emittance, line charge density, matched maximum and average envelope radii, occupancy factors, and the (space charge) depressed and vacuum values of tune. This formulation is an improvement on the smooth limit approximation; deviations from exact (numerically determined) relations are on the order of + or - 2%, while the smooth limit values are in error by up to + or -30%. This transport formalism is used to determine the limits of transportable line charge density in an electrostatic quadrupole array, with specific application to the low energy portion of the High Temperature Experiment of Heavy Ion Fusion Accelerator Research. The line charge density limit is found to be essentially proportional to the voltage on the pole faces and the fraction of occupied aperture area. A finite

injection energy (> or = 2 MeV) is required to realize this limit, independent of particle mass. DOE

N86-16086# Brookhaven National Lab., Upton, N. Y.
MEAN FISSION NEUTRON SPECTRUM ENERGIES FOR (252) Cf AND FISSILE NUCLIDES, (233)U, (235)U, (239)Pu AND (241)Pu
N. E. Holden 1985 7 p refs Presented at the International Conference on Nuclear Data for Basic and Applied Science, Santa Fe, N. Mex., 13 May 1985
(Contract DE-AC02-76CH-00016)
(DE85-013298; BNL-NCS-36380; CONF-850507-38) Avail: NTIS HC A02/MF A01

The international standard for a neutron spectrum is that produced from the spontaneous fission of (252)Cf, while the thermal neutron induced fission neutron spectra for the four fissile nuclides, (233)U, (235)U, (239)Pu and (241)Pu, are of interest from the standpoint of nuclear reactors. There have been many data sets produced in recent years which deal with the shape of these spectra, particularly at both the low energy and the high energy portions of the curve. However, our interest here is in the average neutron energies of these spectra. We have tabulated all measurements for the five nuclides of interest. The individual measurements are recorded with the neutron energy range measured, the method of detection as well as the average neutron energy for each author. Fortunately, the measurements have been performed with a number of techniques, which allows one to estimate the systematic error from the spread in the results for the different techniques. An attempt has been made to renormalize results when the neutron spectrum used for normalization purposes has been given. In addition to the tables of mean energy measurements, we have also tabulated the measurements of the ratio of mean energies for pairs of fission neutron spectra. The following items were considered, where possible, in the analysis of the mean energies of the neutron spectra: the energy scale of the measurement, the determination of the detector efficiency, the sample size and the sample thickness and the scattering corrections made. The recommended mean energies for the spectra considered are shown. The uncertainty listed attempts to estimate the systematic error as well as merely the precision in each of the experiments. The recommended (E/sub n/) values or /sup 233,235/U, /sup 239,241/Pu, and (252)Cf are 2.02 + - 0.03 MeV, 1.98 + - 0.03 MeV, 2.06 + - 0.04 Mev, 2.05 + - 0.05 MeV, and 2.14 + - 0.03 MeV, respectively. DOE

74 OPTICS

Includes light phenomena.

N86-16087 Department of the Air Force, Washington, D.C.
INTERFACE ALIGNMENT SYSTEM Patent
P. J. Pomphrey, Jr., inventor (to Air Force) Issued 23 Jul. 1985 5 p Supersedes AD-D010222
(AD-D011896; US-Patent-4,530,602; US-Patent-Appl-SN-480156; US-Patent-Class-356-138) Avail: US Patent and Trademark Office CSCL 20/6

A novel optical alignment system and method is provided for detecting misalignment of the optical components of a high energy laser comprising a source of radiation, such as a HeNe laser, for providing an alignment beam to intersect the optical path of the high energy system, optical beam splitting means at the intersection of the alignment beam and optical path to direct a first portion of the alignment beam toward the target and a second portion to the high energy cavity, the second portion interacting with the high energy cavity to provide a return beam along the alignment beam axis, and means to display and view the return beam relative to the alignment beam axis. GRA

N86-16088 Department of the Air Force, Washington, D.C.
MULTI-COLOR X-RAY LINE SOURCE Patent
J. D. Eversole, inventor (to Air Force) Issued 11 Jun. 1985 9 p Supersedes AD-D010088
(AD-D011910; US-Patent-4,523,327; US-Patent-Appl-SN-455674; US-Patent-Class-378-124) Avail: US Patent and Trademark Office CSCL 20/6

An anode target is described which comprises a copper block having different elemental target materials bonded to segments of the circumference, which rotate past the electron emitting cathode, to provide different emission lines in sequence. Aluminum and silicon target materials produce lines which bracket the aluminum absorption edge, to detect small amounts of aluminum in the presence of these two lines. Silver and rhodium may be used to bracket the chlorine absorption edge. Author (GRA)

N86-16089*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WAVELENGTH ERROR ANALYSIS IN A MULTIPLE-BEAM FIZEAU LASER WAVEMETER HAVING A LINEAR DIODE ARRAY READOUT
Don M. Robinson, Carl L. Fales, Jr., and Milton W. Skolaut, Jr. Dec. 1985 46 p refs
(NASA-TM-87614; NAS 1.15:87614) Avail: NTIS HC A03/MF A01 CSCL 20F

An estimate of the wavelength accuracy of a laser wavemeter is performed for a system consisting of a multiple-beam Fizeau interferometer and a linear photosensor array readout. The analysis consists of determining the fringe position errors which result when various noise sources are included in the fringe forming and detection process. Two methods of estimating the fringe centers are considered: (1) maximum pixel current location, and (2) average pixel location for two detectors with nearly equal output currents. Wavelength error results for these two methods are compared for some typical wavemeter parameters. Author

N86-16090# University of Southern California, Los Angeles. Center for Laser Studies.
SUBNANOSECOND SHORT WAVELENGTH GENERATION USING OPTICAL FIBERS Final Report, 1 Jan. - 31 Dec. 1984
E. Garmire 15 Feb. 1985 17 p
(Contract F49620-84-C-0016)
(AD-A158769; AFOSR-85-0491TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

A one-year study of nonlinear optical effects in fibers using UV lasers investigated stimulated Raman scattering. Lines were seen due to quartz in fibers and due to organic liquids in liquid-filled capillaries. Benzene formed a waveguide, but in preliminary experiments only 1% was converted to stimulated Stokes scattering. Of particular interest was the discovery of Raman scattering of the nitrogen laser light from the nitrogen vibrational transitions within the laser itself. Such lines have never been reported before. Of additional interest was the multi-line spectral broadening of the stimulated Raman spectra observed from quartz fibers. The reason for this broadening remains to be investigated. Preliminary experiments were performed and apparatus designed which sets the stage for further research into the higher power UV properties of fibers. GRA

N86-16091# Yale Univ., New Haven, Conn.
DROPLET SIZE AND EVAPORATION RATE WITHIN A TWO-PHASE FLOW BY MORPHOLOGY-DEPENDENT RESONANCES IN THE OPTICAL SPECTRA Final Report, 15 Nov. 1981 - 31 Dec. 1984
R. K. Chang, B. T. Chu, and M. B. Long 10 Apr. 1985 28 p
(Contract F49620-82-K-0005)
(AD-A158931; AFOSR-85-0566TR) Avail: NTIS HC A03/MF A01 CSCL 21/4

In two-phase chemically reacting flows, the size, shape, and chemical content of fuel droplets affect combustion and their chemical by-products. A new in-situ and nonintrusive optical technique has been developed which provides highly accurate (one part in 10000 - 100,000) size and shape determination, as well as chemical speciation of the majority species forming the droplet. This all-optical technique uses the morphology-dependent resonances (MDRs) of spheres, spheroids, or any shape that enables

an internal wave to travel around a great circle with appropriate phase shift. These MDRs in the fluorescence spectra of dye-doped droplets flowing in a linear stream have also provided information on: (1) evaporation rate of interacting droplets flowing in the ambient or heated environment; (2) condensation rate of interacting droplets flowing in a saturated vapor; and (3) surface tension and bulk viscosity of individual droplets which have been perturbed by a laser beam so as to cause slight shape distortions, e.g., from spheres to oblate or prolate spheroids. MDRs can provide wavelength selective high Q optical feedback for the internally generated fluorescent and Raman radiation. By using this high optical feedback, lasing from individual dye-tagged droplets of approx. 20 micron radius has been achieved. The potential of using bright lasing droplets as markers in flow diagnostics is promising. Stimulated Raman scattering from individual droplets of approx. 20 micron radius has been achieved. GRA

N86-16092# Department of the Army, Washington, D. C.
LARGE MEMORY ACOUSTO-OPTICALLY ADDRESSED PATTERN RECOGNITION Patent Application
D. A. Gregory, J. G. M. Duthie, and L. L. Huckabee, inventors (to Army) Filed 1 Jul. 1985 14 p
(AD-D011861; US-Patent-Appl-SN-750611) Avail: NTIS HC A02/MF A01 CSCL 20/1

This patent application discloses a method of an apparatus for acousto-optically addressed pattern recognition using Vander Lugt matched filtering. In optical correlation a beam of light containing an image to be examined is directed to fall on a matched filter array that contains a representation of an object of interest. Critical alignment between the beam and a matched filter of the array is achieved by acousto-optical deflection of the light beam. A large number of matched filters can be addressed sequentially at very high sampling rates, thereby providing a large memory capability for coherent optical image processing. In the system an object beam containing an image of interest is directed to a plane of interest where the matched filter is located. An acousto-optical device located in the object beam path is driven by a signal generator at megahertz frequencies. The acousto-optical device converts the megahertz frequency signals to acoustic waves that affect the density of the optical path of the object wave, changing the index of refraction at a selected plane in this path. This spatial modulation of the index of refraction across the path of the wave causes the incident light to be deflected at selectable angles. By proper selection of the megahertz frequency driving signals these variable angles are selected to direct the Fourier transform of the object beam to selected ones of an array of matched filters at the focal plane, allowing rapid correlation of any incoming intelligence information on the object beam with prerecorded information stored in a filter array. GRA

N86-16093# Science Research Corp., Cambridge, Mass.
STIMULATED RAMAN SCATTERING IN THE ATMOSPHERE AND ITS IMPLICATION FOR FELs
31 Jan. 1985 26 p
(Contract W-7405-eng-48)
(DE85-016066; UCRL-15685) Avail: NTIS HC A03/MF A01

In this report we discuss the possibility of rotational Raman conversion of an FEL optical beam as it propagates through the atmosphere. Our report principally concerns itself with FEL characteristics representative of a linear induction accelerator. Under long pulse condition (t sub p greater than or equal to 50 ns) we predict a gain length product 30 sq. cm./MW at 400 nm for an optical path in the Zenith direction. The peak gain for shorter pulse lengths will be smaller than this value. For example, the peak gain for a 10 ns pulse decreases to 26 sq. cm./MW for power levels of MN/sq. cm. Assuming that a gain length product of 30 will result in Raman conversion of the FEL beam as it propagates through the atmosphere, our calculations indicate that a 50 ns beam, having a flux of 1 MN/sq. cm. will be Raman shifted. If the pulse length was decreased to 10 ns conversion should not occur. However, the shorter pulse will have less energy. Our preliminary results indicate that this problem should be investigated in greater detail to determine the optimal laser flux, pulse length, wavelength and pulse repetition rate for the ATA FEL. DOE

N86-16094# Rome Univ. (Italy). Dipt. di Fisica.
SELF-CONSISTENT APPROXIMATION FOR SQUEEZING GENERATION IN A NONLINEAR OPTICAL MEDIUM
Paolo Tombesi 16 Apr. 1985 12 p refs Sponsored by Max-Planck Inst.
(Contract NATO-SA-5-2-05-RG-919/83)
(Nota-Interna-845) Avail: NTIS HC A02/MF A01

By means of a self-consistent approximation it is shown that a system described by a general quadratic Hamiltonian with an added fourth-order term, could generate two-photon coherent states, which can reduce noise fluctuations in one of the quadrature components of the electromagnetic field (i.e., the squeezing effect) since the interaction time needed to observe relevant squeezing is considerably reduced. This property may be utilized to yield low-noise detection systems for gravitational wave detection. Author (ESA)

N86-15423# Hokkaido Univ., Sapporo (Japan).
ATHERMAL CONDITIONS OF OPTICAL ELEMENTS AND PROPERTIES OF OPTICAL MATERIALS
Teruhito Mishima, Kenji Hisadome, and Ichiro Sakuraba *In its* Bulletin of the Faculty of Engineering, Hokkaido Univ., No. 128 Oct. 1985 74 p refs In JAPANESE; ENGLISH summary (For primary document see N86-15420 06-31)
Avail: NTIS HC A06/MF A01

N86-15506# Joint Publications Research Service, Arlington, Va.
PROPERTIES OF OPTICAL FILTERS ON CdSe-HgSe BASE Abstract Only
N. P. Gavaleshko, S. Yu. Paranchich, L. D. Paranchich, and V. G. Antoshchuk *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 58-59 Transl. into ENGLISH from Optiko-Mekhanicheskaya Promyshlennost Leningrad, USSR), no. 1, Jan. 1985 p 10-11 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15508# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF ROUGHNESS OF ENDS OF FIBER OPTIC PLATES ON MODULATION TRANSFER COEFFICIENT Abstract Only
L. I. Vasin, A. V. Guzhevskaya, and D. K. Sattarov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 64 Transl. into ENGLISH from Optiko-Mekhanicheskaya Promyshlennost (Leningrad, USSR), no. 4, Apr. 1985 p 56-57 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15604# Joint Publications Research Service, Arlington, Va.
MEASURING RADIATION ELECTROCONDUCTIVITY OF SOLID DIELECTRICS EXPOSED TO PULSED IONIZING RADIATION Abstract Only
S. N. Makeyev and O. I. Shmid *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 54-55 Transl. into ENGLISH from Elektrotekhnika (Moscow, USSR), no. 12, Dec. 1984 p 48-51 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N86-16095 California Univ., Davis.
EXPERIMENTAL STUDIES OF L SHELL X-RAY EMISSION FROM HIGH DENSITY PLASMAS Ph.D. Thesis
Richard Earl Stewart 1985 374 p

Avail: Univ. Microfilms Order No. DA8514957

The emission spectrum of krypton ionized into the L shell is experimentally studied in a high density plasma discharge. Theoretical calculations are presented which predict the occurrence of electron density dependent effects on the spectrum due to multiple collisions between excited states in the density range produced in these discharges. The high temperature plasma was transiently formed for 2 to 10 nanoseconds in fast linear z-pinch devices at powers ranging from 5 x 10 to the 9 watts to 5 x 10 to the 12 watts by electromagnetic implosion of a column of krypton gas. The gas was seeded with small quantities of argon and phosphene impurities to produce K shell emission lines which were used to diagnose the plasma. The krypton radiation was analyzed using time resolved bent crystal X-ray framing cameras, and time integrated bent crystal X-ray spectrometers and grazing incidence XUV spectrometers. These were used to identify a large number (over 100) of previously unidentified or unobserved lines in Kr XXIV through Kr XXIX. Dissert. Abstr.

N86-16096# Nagoya Univ. (Japan). Inst. of Plasma Physics.
PROCEEDINGS OF COLLABORATING RESEARCH MEETING ON DEVELOPMENT AND APPLICATIONS OF HIGH-POWER PARTICLE BEAMS
Kiyoshi Yatsui, ed. (Nagaoka Technological Univ.) Aug. 1985 201 p refs Meeting held in Nagoya, Japan, 13-14 Nov. 1984 (IPPJ-742) Avail: NTIS HC A10/MF A01

The Sixth Collaborating Research Meeting on Development and Applications of High-Power Particle Beams was held on November 13 and 14, 1984, at the Institute of Plasma Physics of Nagoya University, supported finanically by the Institute of Plasma Physics under a collaborating research program. An intense pulsed light ion beam and partly a relativistic electron beam were discussed in detail. During a two day meeting, twenty one papers or topics were presented particularly associated with pulse-power technology, beam focusing and transport, beam interaction with matter, target design, reactor, and so on. About thirty scientists and technicians including observers attended the meeting to present their research results or discuss the related topics. For individual titles, see N86-16097 through N86-16113.

N86-16097# Osaka City Univ. (Japan). Research Inst. for Atomic Energy.
INVESTIGATION OF DIODE PHYSICS USING AN ANNULAR MAGNETICALLY INSULATED ION DIODE OPERATED IN LONG PULSE MODE
Yoshiro Nakagawa *In* Nagoya Univ. Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams Aug. 1985 p 4-13 refs (For primary document see N86-16096 06-75)
Avail: NTIS HC A10/MF A01

The diode physics, especially correlation between ion beam divergence and irregularities on the cathode surface, of the magnetically insulated ion diode was investigated by using an annular magnetically insulated ion diode operated in long pulse mode. Experimentally observed divergence of the ion beam, deflection of ion direction of motion, spatial non-uniformity of the ion beam and large oscillation of the intensity of the ion beam in time can be attributed to the irregularities of electron sheath or the cathode plasma filamentation in the diode gap. Author

N86-16098# Tokyo Inst. of Tech., Yokahama (Japan). Dept. of Energy Sciences.
EXPERIMENTS ON CRYOGENIC PULSED ION SOURCES
Kazuhika Horioka, Tsutomu Takahashi, Hazime Kuwabara, Hitoki Yoneda, and Koichi Kasuya *In* Nagoya Univ. Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams Aug. 1985 p 14-22 refs (For primary document see N86-16096 06-75)
Avail: NTIS HC A10/MF A01

A newly designed cryogenic diode, whose anode was cooled with liquid helium was developed. The anode was cooled down to 4 to 5 K, and a hydrogen ice frozen on it was used as a flashover ion source. Proton beams of current density 20A/sq cm at 200 kV were extracted with high purity and good reproducibility. Surface flashover processes of low temperature materials were investigated in connection with the cryogenic ion sources. Experiments on them show the strong influence of temperature on insulation strength. Author

N86-16099# Kobe Univ. of Mercantile Marine (Japan). Dept. of Nuclear Engineering.
MAGNETIC INSULATION IN AN ION DIODE WITH TOROIDAL MAGNETIC FIELD
Ichizo Ishigaki, Akira Kitamura, and Syukuro Yano *In* Nagoya Univ. Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams Aug. 1985 p 23-36 refs (For primary document see N86-16096 06-75)
Avail: NTIS HC A10/MF A01

The effects of the cathode geometry on the insulation characteristics in a magnetically insulated ion diode with a toroidal magnetic field have been studied experimentally. It is found that the leakage current of electrons into the anode can be reduced by enclosing the anode with a real cathode or with a virtual cathode in order to provide a nearly constant electric field around the anode. The virtual cathode is formed behind the anode for a diode configuration with a C-shaped real cathode placed only in the front side of the anode, and this is confirmed by measurements of the electron orbits and the space potential. These diodes predict the ion efficiency enhanced by a factor of about 2 and the anode damage reduced by a factor of 0.4, compared with those in the conventional planar diode. Author

N86-16100# Nagoya Univ. (Japan). Inst. of Plasma Physics.
PULSE POWER TRANSPORT TO REB DIODE THROUGH SLENDER MITL
Morihiko Sato, Jun-ichi Mizui, and Hiroaki Yonezu *In its* Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams Aug. 1985 p 37-51 refs (For primary document see N86-16096 06-75)
Avail: NTIS HC A10/MF A01

Direct electric power input to a pellet might be a most simple way for compression in inertial confinement fusion. One of crucial questions in this way is how much power can be transported to the pellet through a slender self-magnetically insulated transmission line (MITL) without a large loss. Experimental results show that the efficiency of pulse power transport is determined from a gap closure time caused by plasma expansion from the anode and the cathode surface of the MITL. It implies a shorter voltage pulse width (approx. 10 to 20 ns) is required for the case of a few mm gap length to attain a high transport efficiency. Author

N86-16101# Nagoya Univ. (Japan). Inst. of Plasma Physics.
GEOMETRIC COMPRESSION OF HOLLOW CYLINDER IN A COAXIAL RELATIVISTIC ELECTRON BEAM DIODE
Jun-ichi Mizui, Morihiko Sato, and Hiroaki Yonezu *In its* Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams Aug. 1985 p 52-60 refs (For primary document see N86-16096 06-75)
Avail: NTIS HC A10/MF A01

Dynamic behaviors of a hollow cylindrical electrode were observed optically in a coaxial diode with circular-pinched electron flow. Motions of the thin cylinder irradiated by an electron beam are divided into an explosive and an ablative mode according to the electron stopping range. When the electron beam produces a surface plasma on the outer electrode, the thin inner electrode also collapses under the stagnation pressure produced by the expanding plasma. Author

N86-16102# Osaka Univ. (Japan). Inst. of Laser Engineering.
GENERATION OF ION BEAMS IN PLASMA FOCUS
Masahiro Yokoyama, Yoneyoshi Kitagawa, and Yoshiyuki Yamada *In* Nagoya Univ. Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams Aug. 1985 p 61-68 refs (For primary document see N86-16096 06-75)
Avail: NTIS HC A10/MF A01

The experimental results on generation of ion and electron beams in plasma focus devices and the models of particle acceleration and emission mechanism are summarized and reviewed. Author

N86-16103# Nagaoka Technological Univ., Niigata (Japan). Lab. of Beam Technology.
CHARACTERISTICS OF INTENSE PULSED ION BEAM EXTRACTED FROM DUAL-CURRENT-FEED MAGNETICALLY-INSULATED DIODE
E. Sai, Y. Shimotori, K. Aga, K. Masugata, M. Ito, and K. Yatsui *In* Nagoya Univ. Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams Aug. 1985 p 69-87 refs (For primary document see N86-16096 06-75)
Avail: NTIS HC A10/MF A01

Experimental studies are presented on characteristics of an intense pulsed ion beam that is extracted from a flat or focusing type of dual-current-feed magnetically-insulated diodes. Energy spectra, proton ratio, divergence angle, and focusing properties are studied for various kinds of ion species in several parameter spaces. Author

N86-16104# Nagaoka Technological Univ., Niigata (Japan). Lab. of Beam Technology.
TIME-RESOLVED MEASUREMENT OF ENERGY AND SPECIES OF AN INTENSE PULSED ION BEAM
T. Matsuzawa, A. Takahashi, K. Masugata, M. Ito, and M. Matsui *In* Nagoya Univ. Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams Aug. 1985 p 88-101 refs (For primary document see N86-16096 06-75)
Avail: NTIS HC A10/MF A01

A time-resolvable Thomson-parabola spectrometer is developed employing a microchannel plate image-intensifier, which acts as a high speed shutter (approx. 5 ns) by gating the applied voltage. Using such a spectrometer, the measurement of temporal behavior of beam energy for various ion species of an intense pulsed ion beam extracted from a dual-current-feed magnetically-insulated diode was achieved. The energy of protons is found to be in good agreement with the diode voltage. Author

N86-16105# Osaka City Univ. (Japan). Research Inst. for Atomic Energy.
OPERATION AT HIGH VOLTAGE AND POWER BRIGHTNESS OF ION BEAM ON CONICAL PINCHED ELECTRON BEAM DIODE
Yoshinobu Matsukawa *In* Nagoya Univ. Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams Aug. 1985 p 102-109 refs (For primary document see N86-16096 06-75)
Avail: NTIS HC A10/MF A01

An operation of a conical pinched electron beam diode was studied at high anode voltage and a comparison of the power density of the ion beam from the point-like origin at the pinch region of this diode was discussed on various types of diode. Author

N86-16106# Tokyo Inst. of Tech., Yokahama (Japan). Dept. of Energy Sciences.
ANALYSIS OF MICROSCOPIC INSTABILITY FOR ROTATING LIB
Masaru Sato and Keishiro Niu *In* Nagoya Univ. Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams Aug. 1985 p 110-120 refs (For primary document see N86-16096 06-75)
Avail: NTIS HC A10/MF A01

The instability of a neutral hollow beam is investigated within the framework of the Vlasov-Maxwell equations. It is assumed that the hollow beam is thin with the radial thickness a which is much smaller than the major radius R sub 0, and that the equilibrium beam charge is neutralized by the background electron charge. The stability analysis is carried out for perturbations about the beam equilibrium distribution function F sup 0 sub B. The detailed instability properties are calculated for a variety of system parameters. Author

N86-16107# Tokyo Inst. of Tech., Yokahama (Japan). Dept. of Energy Sciences.
SIMULATION OF ION-BEAM IN MID
Tetsu Magamatsu, Shigeo Kawata, and Keishiro Niu *In* Nagoya Univ. Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams Aug. 1985 p 121-127 refs (For primary document see N86-16096 06-75)
Avail: NTIS HC A10/MF A01

In recent LIB researches, it is considered that the most suitable system is the Magnetically Insulated Diode (MID) to generate the light ion beam. The ion beam and electron motions in MID A-K gap are treated. Author

N86-16108# Tokyo Inst. of Tech., Yokahama (Japan). Dept. of Energy Sciences.
NUMERICAL ANALYSIS FOR CURRENT NEUTRALIZATION OF ROTATING LIGHT ION BEAM
Takayuki Aoki, Shigeo Kawata, and Keishiro Niu *In* Nagoya Univ. Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams Aug. 1985 p 128-137 refs (For primary document see N86-16096 06-75)
Avail: NTIS HC A10/MF A01

The current neutralization fraction of Rotating LIB injected into a low density plasma (about 1 Torr) is investigated numerically. The beam space charge is easy to be almost neutralized by a redistribution of the background plasma. But if the Larmor radius of the plasma electron is much smaller than electron-ion collision mean-free-path, the return current induced in the plasma is limited to flow by the strong magnetic field associated with the intense LIB. Consequently the beam current cannot be neutralized so much. In this research, the macroscopic treatment of such a phenomenon is presented and the possibility of Rotating LIB propagation is also considered. Author

N86-16109# Tokyo Inst. of Tech., Yokahama (Japan). Dept. of Energy Sciences.
ALPHA-BURNING IN ICF TARGET
Kaori Kaki, Shigeo Kawata, and Keishiro Niu *In* Nagoya Univ. Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams Aug. 1985 p 138-148 refs (For primary document see N86-16096 06-75)
Avail: NTIS HC A10/MF A01

The effect of thermonuclear-product transport in an ICF target is usually calculated by two methods in hydrodynamic simulations of the target implosion. One is based on the diffusion theory and the other accurately describes the thermalization process of the products. Some achieved points of computation of alpha-burning effect in ICF target are presented through comparisons between two results calculated by each method. Author

N86-16110# Tokyo Inst. of Tech., Yokahama (Japan). Dept. of Energy Sciences.
TARGET IMPOSION IN LIB ICF
Shigeo Kawata and Keshiro Niu *In* Nagoya Univ. Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams Aug. 1985 p 149-164 refs (For primary document see N86-16096 06-75)
Avail: NTIS HC A10/MF A01

The LIB transportable window is described for the LIB transportation through the Z-discharged plasma channel. The numerical results of the LIB-target implosion are presented next by the computer analyses. Finally, the problem of numerical computing method is pointed out and the improved one is also presented. By the improved method, the numerical resolution of shock surface is improved and the shock is in one mesh. Author

N86-16111# Tokyo Inst. of Tech., Yokahama (Japan). Dept. of Energy Sciences.
RESEARCH FOR THERMAL BEHAVIOR OF LIQUID-METAL

WALL IN ICF REACTOR
Masaki Tsuruki, Shigeo Kawata, and Keishiro Niu *In* Nagoya Univ. Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams Aug. 1985 p 165-175 refs (For primary document see N86-16096 06-75)
Avail: NTIS HC A10/MF A01

When an ICF reactor is designed, the first wall of the reactor chamber is an important problem. The thermal behavior of the liquid metal is investigated for the water fall type reactor. The liquid metal is used as the first wall. The safety of this type reactor is also discussed. Author

N86-16112# Keio Univ., Yokahama (Japan). Faculty of Science and Technology.
ON THE GROWTH RATE OF RAYLEIGH-TAYLOR INSTABILITY AT THE DECELERATING SHOCK FRONT
Yasumitsu Nakahama and Masatada Ogasawara *In* Nagoya Univ. Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams Aug. 1985 p 176-184 refs (For primary document see N86-16096 06-75)
Avail: NTIS HC A10/MF A01

Consideration of the growth rate of the Rayleigh-Taylor instability at the decelerating shock front is made. The growth rate derived numerically by Murakami, Yabe and Niu has two characteristic features, i.e., (1) sharp decrease at some wavenumber, and (2) existence of a flat part different from the formula the square foot of gk, where k and g are the wavenumber and the acceleration. The above (1) is explained by hydrodynamic flow behind the shock front. Confirmation of the existence of the constant term in the expression of the growth rate by Murakami, et al., is made, but the physical picture for this term is not clear yet. Author

N86-16113# Tokyo Inst. of Tech., Yokahama (Japan). Dept. of Energy Sciences.
PROPOSAL OF POWER PLANT BY LIB FUSION
Keishiro Niu *In* Nagoya Univ. Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams Aug. 1985 p 185-192 refs (For primary document see N86-16096 06-75)
Avail: NTIS HC A10/MF A01

A power plant which generates the output electric power of 0.8 GW is proposed here by using LIB fusion reactor. The target of LIB is biased by -1 MV in order to concentrate the ion beams on the target surface. Inside of the rotating reactor vessel is filled by the flibe which is used as the coolant and the tritium breeder. The flibe is chemically inactive and is easier for handling than the pure liquid lithium. Author

N86-16114# Nagoya Univ. (Japan). Inst. of Plasma Physics.
MAGNETOHYDRODYNAMIC STABILITY OF SPHEREOMAK PLASMA IN TOROIDAL FLUX CONSERVER WITH RECTANGULAR CROSS SECTION. PART 2: APPLICATION OF MERCIER CRITERION
Shobu Kaneko (Tokyo Univ., Japan), Hiroaki Tsutsui (Tokyo Univ., Japan), Takeshi Miyazaki (Hitachi Ltd., Tokyo, Japan), and Masayoshi Taguchi (Tokyo Univ., Japan) Aug. 1985 20 p refs (IPPJ-743) Avail: NTIS HC A02/MF A01

The magnetohydrodynamic equilibrium states by Hill's vortex model and by the Coulomb-wave-function model are proved to be unstable. New MHD equilibrium configurations are determined by using another model for which dp/d psi=0 on the magnetic axis. Here p is the pressure and psi is the flux function. The values of the safety factor on the magntic axis, q sub axis are evaluated for these configurations. The MHD stability of these equilibrium states is investigated by the Mercier criterion. The values of the maximum beta ratio beta sub max are evaluated for this model. The optimized pressure distributions are determined by use of the Mercier criterion and the values of beta sub max are also evaluated for these pressure distributions. The values of beta sub max are shown to be at most 12%, if the condition q sub axis < 1 is required. Author

N86-16115# Naval Research Lab., Washington, D. C.
NONLINEAR ANALYSIS OF A RELATIVISTIC BEAM-PLASMA CYCLOTRON INSTABILITY Memorandum Report, Oct. 1984 - Sep. 1985
P. Sprangle and L. Vlahos 19 Sep. 1985 35 p
(RR0-1109)
(AD-A159159; NRL-MR-5595) Avail: NTIS HC A03/MF A01 CSCL 20/7

A self-consistent set of nonlinear and relativistic wave-particle equations are derived for a magnetized beam/plasma system interacting with electromagnetic cyclotron waves. In particular, the high frequency cyclotron mode interacting with a streaming and gyrating electron beam within a background plasma is considered in some detail. This interaction mode may possibly find application as a high power source of coherent short wavelength radiation for laboratory devices. The background plasma, although passive, plays a central role in this mechanism by modifying the dielectric properties in which the magnetized electron beam propagates. For a particular choice of the transverse beam velocity, i.e., speed of light/relativistic mass factor, the interaction frequency equals the nonrelativistic electron cyclotron frequency times the relativistic mass factor. For this choice of transverse beam velocity the detrimental effects of a longitudinal beam velocity spread is virtually removed. Power conversion efficiencies in excess of 18% are both analytically calculated and obtained through numerical simulations of the wave-particle equations. The quality of the electron beam, degree of energy and pitch angle spread, and its effect on the beam-plasma cyclotron instability is studied. GRA

N86-16116# Fermi National Accelerator Lab., Batavia, Ill.
ISOLATED DATA ACQUISITION SYSTEM FOR HIGH VOLTAGE APPLICATIONS
A. Waitz and A. Donaldson Jun. 1985 4 p Presented at the Particle Accelerator Conference, Vancouver, British Columbia, 13 May 1985 Prepared in cooperation with Fermi National Accelerator Lab., Batavia, Ill.
(Contract DE-AC02-76CH-03000)
(DE85-016984; FNAL-TM-1323; CONF-850504-247) Avail: NTIS HC A02/MF A01

This report describes the design and operation of a microcomputer controlled system for acquisition of both analog and binary data within the high voltage stages of a linac modulator. The system is comprised of a microprocessor Controller which communicates with the remote data acquisition circuits via an optical bus. The bus, which uses a 1 MHz Manchester II format, is configured as a loop, starting at the Controller, daisy-chaining the remote cards and terminating back at the Controller. Upon receiving a linac timing pulse, the Controller sends addressed commands to the individual remote cards and receives data back. It then passes this data to the linac control system through a Multibus connection. Each remote circuit can return 16 binary sense and 7 (12 bit) analog parameters within 270 microseconds. This speed is possible because of a pipelined design where one word is transmitted while another is being converted. A data conversion cycle is initiated when a remote data acquisition card receives the proper command and address from the controller. DOE

N86-16117# Fermi National Accelerator Lab., Batavia, Ill.
DEPENDENCE OF CHARGE COLLECTION DISTRIBUTIONS AND DOSE ON THE GAS TYPE FILLING THE IONIZATION CHAMBER FOR A p(66)Be(49) CLINICAL NEUTRON BEAM
M. Awschalom and R. K. T. Haken Jan. 1985 33 p refs
(Contract DE-AC02-76CH-03000)
(DE85-017366; FNAL-TM-1296) Avail: NTIS HC A03/MF A01

Measurements of central axis depth charge distributions (CADCD) in a P(66)Be(49) clinical neutron beam using A-150 TE plastic ionization chambers (IC) have shown that these distributions are dependent on the gas type filling the ICs. IC volumes from 0.1 to 8 cm(3) and nine different gases were investigated. Off axis ratios and build-up measurements do not seem to be as sensitive to gas type. The gas dosimetry constants given in the AAPM Protocol for Neutron Beam Dosimetry for air and methane based TE gases were tested for consistency in water and in TE

solution filled phantoms at depths of 10 cm, when used in conjunction with an IC having 5 mm thick walls of A-150. DOE

N86-16118# Los Alamos National Lab., N. Mex.
LASER PRODUCED PLASMA AFFECTS ON WELDING
16 Sep. 1985 4 p Presented at the 8th Annual Gas Discharge Conference, Oxford, 16 Sep. 1985
(Contract W-7405-eng-36)
(DE85-009638; LA-UR-85-994; CONF-850979-1) Avail: NTIS HC A02/MF A01

Acoustic data and high speed pictures indicate that a laser-supported combustion wave (LSCW) is generated and propagates away from the surface in the direction toward the laser. The high speed pictures also show that numerous plasmas are generated during one laser pulse. The optical data show that the number of plasmas generated and their initiation times depend upon laser power. The depth of penetration is also dependent upon the number of plasmas generated, with more plasmas producing more penetration. This latter fact supports the conclusion that the plasma improves the efficiency of the laser process. Thus, a plasma in the form of a laser supported combustion wave is generated and acts to convert the poorly absorbed laser radiation into blackbody radiation. The blackbody radiation has a broadband short wavelength spectrum which is readily absorbed by most materials. DOE

N86-16119# Los Alamos National Lab., N. Mex.
PLASMA HEATING EFFECTS DURING LASER WELDING
G. K. Lewis and R. D. Dixon 1985 11 p Presented at the 11th International Welding Fair, Essen, West Germany, 11 Sep. 1985
(Contract W-7405-eng-36)
(DE85-010776; LA-UR-85-1141; CONF-850975-1) Avail: NTIS HC A02/MF A01

Laser welding is a relatively low heat input process used in joining precisely machined components with minimum distortion and heat affects to surrounding material. The CO2 (10.6 (MU)m) and Nd-YAG (1.06 (MU)m) lasers are the primary lasers used for welding in industry today. Average powers range up to 20 kW for CO2 and 400 W for Nd-YAG with pulse lengths of milliseconds to continuous wave. Control of the process depends on an understanding of the laser-plasma-material interaction and characterization of the laser beam being used. Inherent plasma formation above the material surface and subsequent modulation of the incident laser radiation directly affect the energy transfer to the target material. The temporal and spatial characteristics of the laser beam affect the available power density incident on the target, which is important in achieving repeatability in the process. Other factors such as surface texture, surface contaminants, surface chemistry, and welding environment affect plasma formation which determines the weld penetration. This work involves studies of the laser-plasma-material interaction process and particularly the effect of the plasma on the coupling of laser energy to a material during welding. A pulsed Nd-YAG laser was used with maximum average power of 400 W. DOE

N86-16120# Los Alamos National Lab., N. Mex.
LASER INTRACAVITY ABSORPTION AS A PLASMA DIAGNOSTIC AID
G. A. Wurden 1985 6 p Presented at the 2nd International Symposium on Laser Aided Plasma Diagnostics, Culham, England, 10 Sep. 1985
(Contract W-7405-eng-36)
(DE85-015741; LA-UR-85-2669; CONF-8509127-2) Avail: NTIS HC A02/MF A01

Trace levels of lithium are detected on 100 (MU)sec timescales using an electrooptically tuned CW dye laser, in conjunction with a high resolution 0.03 A spectrometer/optical multichannel analyzer. The spectra of Li(7) resonance lines at 6708 A are analyzed for their Zeeman splitting patterns, after unfolding the effects of intracavity absorption (ICA) on the lineshape. For these timescales, a sensitivity to approx. 1 X 10 to the 7 lithium atoms/cc at a level of (Delta)I/I approx. 10% has been observed, corresponding to enhancement factors over single pass absorption of approx. 1000X. Intracavity enhancement of the line structure in the of the line, and a weak blue shift asymmetry have also been observed, but always in the presence of a central absorption feature. The 0.1 A instantaneous laser linewidth is usually scanned over a 1 A range, at frequencies up to 30 kHz. Ultimately this detection system will enclose a hot, dense fusion plasma intersecting an 80 keV, 10 mA neutral lithium beam to probe the plasma internal magnetic field structure, in a non-intrusive fashion. DOE

N86-16121# California Univ., Berkeley. Lawrence Berkeley Lab.
POWER COMBINERS/DIVIDERS FOR LOOP PICKUP AND KICKER ARRAYS FNAL STOCHASTIC COOLING RINGS
J. K. Johnson and R. Nemetz May 1985 6 p Presented at the Particle Accelerator Conference, Vancouver, Canada, 13 May 1985
(Contract DE-AC03-76SF-00098)
(DE85-016562; LBL-19528; CONF-850504-256) Avail: NTIS HC A02/MF A01

The anti-proton accumulator and debuncher at FNAL will use stochastic methods to cool the beam. Pairs of quarter-wavelength directional-couple-r loops are used to detect and kick the beam. The loops are copper plates which are flush with the upper and lower wall of a rectangular beam pipe. The plates, when surrounded by a properly sized pocket, form a 100-ohm transmission-line directional coupler. As the beam passes, a signal which gives position and time information, is induced in the plates. But, because the signal levels are low (.5 picowatts power pair), a power combiner (usually several primary combiners feeding a secondary combiner) is used to combine the outputs of many loops. Subsequently, the combined signal is amplified, filtered and then fed into a divider, (that is, a combiner operating in reverse). The divider distributes the signal into a different set of loops which modify (kick) the beam's position. Since the loop couplers are arranged linearly, in arrays of various lengths, combiners also provide a convenient method of reducing the number of vacuum feedthroughs and preamplifiers and their related costs in performance and dollars. In this note we describe various stripline combiner systems that add the outputs of 4, 8, 16 or 32 loops. DOE

N86-16122# Columbia Univ., New York. Plasma Physics Lab.
LARGE ASPECT RATIO, HIGH-BETA TOKAMAK FUSION REACTOR
G. A. Navratil 1985 29 p
(Contract DE-AC02-76ET-53016)
(DE85-016654; DOE/ET-53016/87) Avail: NTIS HC A03/MF A01

This paper presents an analysis of a large aspect ratio (R/a about 9) tokamak reactor, with a circular plasma cross-section, operating in the high-beta second stability regime. Engineering advantages of such a system include good access, simple poloidal coil design with no coils inside the toroidal magnet set, low toroidal plasma current, and higher toroidal magnetic field on axis. MHD equilibra which are stable at high beta exist for this configuration. The gap between the first and second stable regimes of operation is narrowed considerably at high aspect ratio. Reactor designs based on present confinement scaling data are presented together with a description of a medium sized experiment which can explore the important physics questions associated with this attractive class of fusion reactor. DOE

N86-16123# Lawrence Livermore National Lab., Calif.
SOLUTION OF THE FIELD EQUATIONS FOR 2-D ELECTROMAGNETIC DIRECT IMPLICIT PLASMA SIMULATION
D. W. Hewett and A. B. Langdon 2 Jan. 1985 5 p Presented at the 11th International Conference on Numerical Simulation of Plasmas, Montreal, Canada, 25 Jun. 1985
(Contract W-7405-eng-48)
(DE85-016073; UCRL-92041; CONF-850659-1) Avail: NTIS HC A02/MF A01

A direct implicit particle-in-cell (PIC) simulation model with full electromagnetic (EM) effects has been implemented in 2-D Cartesian geometry. The model, implemented with the D1 time differencing scheme, was first implemented in a 1-D electrostatic

(ES) version to gain some experience with spatial differencing in forms suitable for extension to the full EM field in two dimensions. The implicit EM field solve is considerably different from the implicit ES code. The EM field calculation requires an inductive part as well as the electrostatic and the B field must be self-consistently advanced. DOE

N86-16124# Washington Univ., Seattle. Nuclear Physics Lab.
SUPERCONDUCTING RESONATORS FOR THE UNIVERSITY OF WASHINGTON BOOSTER LINAC
D. W. Storm, J. M. Brennan, and I. Ben-Zvi 1985 4 p refs Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985 Prepared in cooperation State Univ. of New York, Stony Brook and Weizmann Inst. of Science, Rehovoth, Israel
(Contract DE-AC06-84ER-40124)
(DE85-017419; DOE/ER-40124/6; CONF-850504-271) Avail: NTIS HC A02/MF A01

We have developed two models of a 150 MHz quarter wave resonator - one with optimum beta = 0.10 and one with optimum beta = 0.21. These are lead-plated copper structures. The prototype beta = 0.10 resonator was tested successfully a year ago and gave average accelerating fields of 3.5 MV/m with 4.2 watts dissipated. It is quite similar to the resonator developed by the second and third authors. We have made and tested several more of this model. A prototype beta = 0.21 resonator has been completed, but weld flaws have prevented definitive tests. In order to minimize surface electric fields in the high-beta resonator, there were some modifications in the drift tube shape beyond those required to change the optimum beta. These quarter wave resonators have a wide transit time factor curve and are extremely rigid mechanically. Variations in eigen-frequency due to mechanical vibrations are less than 1 Hertz. Maximum attainable fields are limited by field emission. DOE

N86-16125# Sandia National Labs., Albuquerque, N. Mex.
PBFA-2 VACUUM SYSTEM DESIGN USING A LUMPED PARAMETER COMPUTER MODEL
J. S. Cap, L. X. Schneider, and J. D. Boyes 1985 16 p Presented at the 5th IEEE Pulsed Power Conference, Washington, D.C., 10 Jun. 1985
(Contract DE-AC04-76DP-00789)
(DE85-013117; SAND-84-2517C; CONF-850616-24) Avail: NTIS HC A02/MF A01

The PBFA-2 vacuum vessel which houses the power flow lines and ion diode presented a difficult engineering problem in analyzing the pressure distribution throughout the chamber. The vessel utilizes a typical construction of stacked lucite and aluminum rings with their associated high outgassing loads. The transmission lines are a series of stacked cones and toroids that form an interconnected network of annular pathways. Calculating the steady state pressure distribution required solving 30 simultaneous equations, and any transient solution was virtually impossible by hand. This paper describes a computer model developed using the direct analogy between fluid flow parameters and electrical parameters. This model can then be solved as a lumped parameter electrical circuit using the differential network analysis program, SCEPTRE. The overall design of the vacuum system, including the choice of helium cryopumps and water vapor cryopumps to handle the anticipated heavy water vapor load, is also discussed. DOE

N86-15442# Joint Publications Research Service, Arlington, Va.
SELF-QUENCHING STREAMER DISCHARGE CHARACTERISTICS AT EXTREME GAS COMPOSITIONS
You Tiejian, Yang Baozhong, and Chen Hongfang *In its* China Report: Science and Technology (JPRS-CST-85-038) 5 Nov. 1985 p 64-67 refs Transl. into ENGLISH from Zhongguo Kexue Jishu Daxue Xuebao (Hefei), v. 14, no. 2, Jun. 1984 p 295-297 (For primary document see N86-15438 06-31)
Avail: NTIS HC A06/MF A01

N86-15466# Joint Publications Research Service, Arlington, Va.
PLASMA PARAMETERS AT LOW LEVEL OF INTRINSIC MICROWAVE RADIATION Abstract Only
V. N. Kolesnikov and Yu. G. Tishchenko *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-009) 4 Sep. 1985 p 61 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 30, no. 1, Jan. 1985 p 102-105 Previously announced in IAA as A85-23561 (For primary document see N86-15452 06-31)
Avail: NTIS HC A06/MF A01

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N86-16126# Rockwell International Science Center, Thousand Oaks, Calif.
RESEARCH ON THE CRYSTAL GROWTH AND DIELECTRIC PROPERTIES OF HIGH PERMITTIVITY FERROELECTRIC MATERIALS Annual Report, 1 Mar. 1984 - 28 Feb. 1985
R. R. Neurgaonkar Jul. 1985 68 p
(Contract N00014-81-C-0463)
(AD-A157820; SC5345.5AR) Avail: NTIS HC A04/MF A01 CSCL 20/3

Millimeter wave measurements on tungsten bronze Sr0.6Ba0.4Nb2O6 (SBN:60) and Ba2-xSrxK1-yNayNb5O15(BSKNN) have shown a strong temperature dependence for permittivity and dielectric loss, with both decreasing at low temperature down to 77K for the electric field parallel to the polar axis. The observed changes in and perpendicular to the polar axis are much less, being only 30-40%. A temperature sensitive peak in the polar has been observed for some samples. First experimental determination of the millimeter wave dn/dE for SBN:60 single crystal has been demonstrated successfully at cryogenic temperature. These results are encouraging both for basic understanding of the mechanisms controlling millimeter wave susceptibilities in ferroelectric tungsten bronze as well as for practical device applications. It has been shown for SBN:60 that the large millimeter wave nonlinear response is retained at cryogenic temperature (dn3/dE3 = .0000005m/V at 77K) while the absorption is reduced by an order of magnitude. The experimental database has allowed, for the time, the construction of a modeling work based on coupling of the microwave field to acoustic phonons which is consistent with the observations. GRA

N86-16127# Wisconsin Univ., Madison. Dept. of Physics.
THIN SUPERCONDUCTING FILM CHARACTERIZATION BY SURFACE ACOUSTIC WAVES Research Progress Report, 30 Sep. 1984 - 22 Apr. 1985
M. Levy 22 Apr. 1985 11 p
(Grant AF-AFOSR-0350-84)
(AD-A158311; AFOSR-85-0528TR) Avail: NTIS HC A02/MF A01 CSCL 20/12

Both the dc electrical resistivity and the attenuation of surface acoustic waves (SAW) were measured in the superconducting state of a granular lead film as a function of an applied magnetic field normal to the film plane. At 4.2 K the data appear to yield an upper critical of about 60 K Gauss and a lower critical field of about 20 K Gauss. A theoretical model that takes into account renormalization has been developed for explaining the SAW attenuation in a superconducting NbN film with a sheet resistivity of 30 k ohms/sq. Bulk ultrasonic measurements in the ferromagnetic superconductors Er(x)Ho(1-x)Rh4B4 indicate that spin phonon interaction increases in the superconducting state of these ternary compounds. Ultrasonic measurements in very pure vanadium single crystals provide low temperature data which yield a zero temperature energy gap 2 Delta(0) that is very close to the BCS value of 3.5 kT sub c but the data close to the superconducting transition temperature T sub c would yield 2 Delta

(0) = 4.2 kT sub c. A theoretical model is being investigated to ascertain if it will resolve this apparent discrepancy. GRA

N86-16128# Honeywell Systems and Research Center, Minneapolis, Minn.
SUPERLATTICE OPTICAL BISTABILITY RESEARCH Annual Report, 5 Jul. 1984 - 30 Jun. 1985
M. M. Tehrani and P. Chow 22 Jun. 1985 15 p
(Contract F49620-84-C-0071)
(AD-A158876; AFOSR-85-0656TR; AR-1) Avail: NTIS HC A02/MF A01 CSCL 20/6

This report describes work performed on a program for fabrication and characterization of nonlinear optical properties of HgCdTe superlattices. We determined early on that performing nonlinear optical experiments (i.e., optical phase conjugation and optical bistability) on such superlattices requires the fabrication of thick > or = 2 micron samples. The growth of thick superlattices with very thin individual layers, on the other hand, can best be accomplished by using an automated molecular beam epitaxy (MBE) system. We launched a major effort to automate our existing MBE system which is due for completion by the end of July 1985. This report also describes the automation design, software, and the computer-controlled hardware. GRA

N86-16129# Georgia Tech Research Inst., Atlanta.
INTEGRATED OPTOELECTRONIC CIRCUITS UTILIZING InGaAsP GROWN BY MOLECULAR BEAM EPITAXY Annual Report, 1 Jan. 1983 - 25 Nov. 1984
E. L. Meeks, C. J. Summers, and N. W. Cox 25 Nov. 1984 54 p
(Contract N00014-83-K-2017)
(AD-A159403) Avail: NTIS HC A04/MF A01 CSCL 20/12

A phosphorus source suitable for InP or quaternary MBE growth was developed and tested. The source cracks the P4 molecules sufficiently to greatly improve the phosphorus sticking coefficient; the flux can be monitored at all times during growth but the long term stability of the source as presently manufactured is not sufficient for quaternary alloy ratio control; and the source has a useful lifetime compatible with the requirements of good MBE layer growth. A duplicate arsenic source was also developed and tested. Indium phosphide layers have been grown with excellent room temperature mobility and the necessity of a cracking phosphorus source confirmed. Electrical and optical characterization of the layers indicate that the layers are highly compensated which is consistent with the poor quality of the background vacuum during growth. Little improvement can be anticipated in the present MBE system. Many quaternary layers have been grown with the new phosphorus and arsenic sources. The best layers grown on InP were matched to within 1.0%. It is expected that with the data obtained thus far, the lattice match can be consistently improved only with a positive, stable real time flux control on both the As and the P sources. A new MBE system for phosphorus compounds has been designed and is being fabricated. The new system can accommodate 1.5 in. diameter substrates, has sample rotation, and two stages of vacuum interlocking for sample introduction. GRA

N86-16130# California Univ., Los Angeles. Dept. of Materials Science and Engineering.
PREPARATION AND PROPERTIES OF TRANSITION METAL BETA ALUMINAS
J. D. Barrie, B. Dunn, O. M. Stafsudd, and G. C. Farrington Sep. 1985 7 p
(Contract N00014-83-K-0498)
(AD-A159408; TR-4) Avail: NTIS HC A02/MF A01 CSCL 20/2

Ion exchange techniques were used to produce a family of 3d transition metal Beta-alumina single crystals. Complete or nearly complete replacement was obtained for Cr3+, Mn2+, and Ni2+ compositions. Optical properties of the crystals were studied and both broad absorption and broad fluorescence bands were observed. Environmental exposure produced detrimental effects over long time periods, suggesting hydration of the conduction planes. The preparation of a new family of Beta aluminas by the substitution of 3d transition metal ions for Na+ ions has enabled us to begin investigating a new series of materials with potential as solid state tunable lasers. The optical properties of these materials compare favorably with those of materials previously studied, and the vast benefits of ion exchange as a preparation technique permit the synthesis of many samples covering a wide variety of active ion concentrations. Initial results with Cr3+ exchanged Beta alumina indicate that hydration effects may influence the optical properties of this material. GRA

N86-16131# Graz Univ. (Austria).
SUBMICRON PHONICS 1 Interim Report, Dec. 1984 - Mar. 1985
22 Mar. 1985 7 p
(Contract DAJA45-84-M-0394)
(AD-A159421; IR-2) Avail: NTIS HC A02/MF A01 CSCL 09/1

Theoretical prediction of the speed of Gallium Arsenide submicron-devices by considering for the first time possible effects of phonon disturbances on the electron-mobility is discussed. The displaced maxwellian model for hot electrons in the central valley of polar semiconductors was extended to include the detailed time-dependence of longitudinal optical (LO) phonon amplification in n-GaAs at room-temperature in the velocity-overshoot regime. Assuming a practically instantaneous adaption of the electrons to the LO-phonon built-up, which in turn is calculated from the time-dependent Phonon-Boltzmann-equation, the FORTRAN-code for spatially homogenous transport was developed and put to a first use. GRA

N86-16132# North Carolina State Univ., Raleigh. Dept. of Materials Engineering.
FUNDAMENTAL STUDIES AND DEVICE DEVELOPMENT IN BETA SILICON CARBIDE Semiannual Progress Report, 1 Mar. - 31 Aug. 1985
R. F. Davis 31 Aug. 1985 60 p
(Contract N00014-82-K-0182; DA Proj. RR0-2102)
(AD-A159446) Avail: NTIS HC A04/MF A01 CSCL 20/12

The research of this reporting period has involved the growth of large area thin films of Beta-SiC; the study of the effect of defects at the interface region on dopant getting; various aspects of doping via ion implantation, calculation of the critical energies to cause amorphization, etching of the resultant amorphous layer, and charge carrier activation during annealing; n(+)p junction development via ion implantation, and oxidation and reactive ion etching studies. GRA

N86-16133# Department of the Air Force, Washington, D.C.
SELECTIVE ANODIC OXIDATION OF SEMICONDUCTORS FOR PATTERN GENERATION Patent Application
B. Davari, inventor (to Air Force) Filed 1 Nov. 1984 31 p
(AD-D011889; US-Patent-Appl-SN-667306) Avail: NTIS HC A03/MF A01 CSCL 20/12

The present invention relates to GaAs integrated circuit technology, and in particular, to a novel means of controlling oxidation growth rate on anodically oxidized GaAs samples. This abstract discloses an apparatus and a method for selectively controlling anodic oxide growth on semiconductors for controlled electrochemical pattern generation incorporating use of a writing beam of a wavelength which encourages oxide and a bias beam at a wavelength which discourages oxide growth. The bias beam is projected on the semiconductor in electrolytic environment to prevent or retard oxide growth while oxide growth is accelerated at points of illumination by means of writing beam. GRA

N86-16134# Oak Ridge National Lab., Tenn.
SPIN DYNAMICS OF A Cu-Mn SPIN GLASS ALLOY
J. W. Cable, R. M. Nicklow, and Y. Tsunoda Jul. 1985 13 p
Presented at the International Conference on Neutron Scattering, Santa Fe, New Mexico, 19 Aug. 1985 Prepared in cooperation with Osaka Univ., Japan
(Contract DE-AC05-84OR-21400)
(DE85-016295; CONF-850871-4) Avail: NTIS HC A02/MF A01

Inelastic neutron scattering measurements were made on Cu-Mn spin-glass alloys to compare the spin dynamics associated

with the ferromagnetic and antiferromagnetic spin-pair correlations present in these alloys. These correlations give rise to elastic diffuse peaks at Q = (1, 0.5, 0) and 1, 0.5 + or - delta, 0), respectively. Constant-Q measurements on Cu-10% Mn and Cu-21% Mn at 295 K yield the same inverse relaxation times at these two positions in Q. These results indicate that composite ferro-antiferromagnetic-clusters exist both above and below T sub f and fluctuate in time while maintaining their spatial correlations. DOE

N86-16135# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

STRUCTURAL AND ELECTRICAL CHARACTERIZATION OF POLYCRYSTALLINE SEMICONDUCTOR MATERIALS

R. J. Matson and Y. S. Tsuo Jul. 1985 8 p Presented at the 2nd Spring Meeting of the Materials Research Society, San Francisco, California, 15 Apr. 1985

(Contract DE-AC02-83CH-10093)

(DE85-012166; SERI/TP-213-2689; CONF-850421-13) Avail: NTIS HC A02/MF A01

Secondary electron imaging, electron channeling and electron-beam-induced current (EBIC) are used alternately in a scanning electron microscope to characterize and correlate the morphology, crystallographic orientation, and electronic quality (types and spatial distribution of defects) of individual grains in polycrystalline semiconductor samples. The technique is discussed in some detail, and a number of applications and results in the study of edge-supported-pulling (ESP) silicon sheet and low-angle silicon sheets (LASS) materials are reported. DOE

N86-16136# Los Alamos National Lab., N. Mex.

STRUCTURAL EXAMINATION OF IRIDIUM-BASED SINGLE-CRYSTAL PREPARATIONS

Keith Martin Azler and Raymond Brad Roof 1985 5 p Presented at the 34th Denver X-Ray Conference, Colorado, Aug. 1985

(Contract W-7405-eng-36)

(DE85-017550; LA-UR-85-2920; CONF-8508118-1) Avail: NTIS HC A02/MF A01

A high-temperature crystal growth experiment produced discrete single-crystal products of All and IrSi. The preparation and examination of these phases is described. This project is part of a materials compatibility study relating to radioisotopic heat sources. These heat sources are comprised of a PuO2 fuel pellet encapsulated in an Ir alloy containment shell. Th is introduced as an additive within the Ir to maintain ductility. Si and P are picked up inadvertently in the fuel processing. The compatibility of the heat sources with Al is of interest because of potential interactions with the Al alloy hardware associated with the heat source environment. DOE

N86-16137# Sandia Labs., Albuquerque, N. Mex.

COMPARISON OF 2D MEMORY SEU TRANSPORT SIMULATIONS WITH EXPERIMENTS

J. S. Fu, R. Koga, and W. A. Kolasinski 1985 16 p Prepared in cooperation with Aerospace Corp., El Segundo, Calif.

(Contract DE-AC04-76DP-00789)

(DE85-016134; SAND-85-1680C) Avail: NTIS HC A02/MF A01

Single event upset (SEU) simulations in SRAM cells have been carried out and the results are compared to experimental data on 16K bit memories. The simulations consisted of simultaneous calculations of charge transport and transient circuit response for four cross-coupled CMOS transistors following the introduction of a sheet of excess carriers into the off p-channel drain. The experiments collected upset rates produced in the memories by 163 MeV argon ions directed normally to the chip surface. Agreement between experiment and calculation was achieved only when the p-channel transistors were integrated into a single block of silicon as the chip layout and scaling was done on the Auger coefficients to compensate for an inherent 2D effect, which artifically distorts the generation densities into the unmodeled dimension of the device width. DOE

N86-16138# Los Alamos National Lab., N. Mex.

OVERLAP OF ELECTRON CORE STATES FOR VERY HIGH COMPRESSIONS

G. Straub 1985 11 p refs Presented at the American Physical Society Topical Conference on Shock Waves in Condensed Matter, Spokane, Washington, 22 Jul. 1985

(Contract W-7405-eng-36)

(DE85-015745; LA-UR-85-2598; CONF-850736-51) Avail: NTIS HC A02/MF A01

At normal density and for modest compressions, the electronic structure of a metal can be accurately described by treating the conduction electrons and their interactions with the usual methods of band theory. The core electrons remain essentially the same as for an isolated free atom and do not participate in the bonding forces responsible for creating a condensed phase. As the density increases, the core electrons begin to see one another as the overlap of the tails of wave functions can no longer be neglected. The electronic structure of the core electrons is responsible for an effective repulsive interaction that eventually becomes free-electron-like at very high compressions. The electronic structure of the interacting core electrons may be treated in a simple manner using the Atomic Surface Method (ASM). The ASM is a first-principles treatment of the electronic structure involving a rigorous integration of the Schroedinger equation within the atomic-sphere approximation. Solid phase wave functions are constructed from isolated atom wave functions and the band width W sub 1 and the center of gravity of the band C sub 1 are obtained from simple formulas. The ASM can also utilize analytic forms of the atomic wave functions and thus provide direct functional dependence of various aspects of the electronic structure. Of particular use in understanding the behavior of the core electrons, the ASM provides the analytic density dependence of the band widths and positions. DOE

N86-16139# Ames Lab., Iowa.

ELECTRONIC STRUCTURE OF RARE EARTH METALS AND INTERMETALLICS

B. N. Harmon 1985 8 p refs Presented at the International Conference on Rare Earth-Development and Applications, Beijing, China, 10 Sep. 1985

(Contract W-7405-eng-82)

(DE85-015523; IS-M-549; CONF-8509133-1) Avail: NTIS HC A02/MF A01

A review is given of recent progress in electronic structure determinations and in the development of new techniques for studies of electron-lattice coupling and magnetism. DOE

N86-16140# Sandia Labs., Albuquerque, N. Mex.

HETEROGENEOUS RESPONSE OF ALUMINUM AND LITHIUM NIOBATE TO SHOCK WAVES

F. C. Perry and D. D. Noack 1985 12 p Presented at the American Physical Society Topical Conference on Shock Waves in Condensed Matter, Spokane, Washington, 22 Jul. 1985

(Contract DE-AC04-76DP-00789)

(DE85-013963; SAND-85-0377C; CONF-850736-10) Avail: NTIS HC A02/MF A01

Heterogeneous shock effects were studied in aluminum (6061-T6) and single crystal lithium niobate (Z-cut) in the range 0.7 to 4.5 GPa by means of holographic interferometry. Heterogeneous yielding in lithium niobate was observed directly for the first time. In addition, nucleation or activation of defects were observed in both aluminum and lithium niobate. The single crystal data indicate that a defect-dominated fracture process constitutes a reasonable model for shock compression. The polycrystalline data suggest that similar pattern will prevail at a sufficiently high pressure. DOE

N86-16141# Rome Univ. (Italy). Dipt. di Fisica.

STATISTICAL MODEL FOR THE TRAPPING OF INTERSTITIALS BY SUBSTITUTIONAL (INTERSTITIAL) ATOMS IN SOLIDS

G. Cannelli (CNR, Rome), R. Cantelli (CNR, Rome), and F. Cordero 28 Feb. 1985 22 p refs

(Preprint-442) Avail: NTIS HC A02/MF A01

The distribution of interstitial atoms in a lattice containing trapping centers was studied using Fermi-Dirac statistics. It is assumed that the energies of free and trap sites are distributed according to density of state functions, and the populations of the various types of clusters were calculated as a function of concentration and temperature; cases in which types of clusters are prohibited were taken into account. The results are satisfactorily applied to internal friction to explain the anomalous relaxation observed in crystalline and amorphous metal-hydrogen (deuterium) systems. Author (ESA)

N86-16142# Rome Univ. (Italy). Dipt. di Fisica.
METAL-INSULATOR TRANSITION AND LANDAU FERMI LIQUID THEORY
Claudio Castellani and Carlo DiCastro 16 Apr. 1985 14 p refs (Nota-Interna-844) Avail: NTIS HC A02/MF A01

The discovery that interaction effects with disorder give anomalous correction terms to the normal Fermi liquid behavior of an electron system is discussed. In the pure disorder case the first quantum correction term due to the diffusion propagator in the particle-particle channel leads to a value equal to unity for the index specifying the power law behavior of the conductivity in terms of deviation from the critical impurity concentration. In the presence of either an external magnetic field or of magnetic impurities, this term is absent, and the leading higher order correction term due to the diffusion propagator in the particle-hole channel (diffusion) leads to a value of a half for the index. Explanations involving noninteracting electrons in disordered media, and correlation effects in nondisordered electron gas are reviewed. Author (ESA)

N86-15509# Joint Publications Research Service, Arlington, Va.
GENERATION OF ELECTROMAGNETIC RADIATION IN RADIO-FREQUENCY BAND IN SOLIDS EXPOSED TO LASER RADIATION Abstract Only
A. D. Pogrebnyak and S. V. Rakitin *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 67 Transl. into ENGLISH from Izvestiya Akademii Nauk SSSR: Seriya Fizicheskaya (Moscow, USSR), v. 49, no. 4, Apr. 1985 p 773-775 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

N86-15589# Joint Publications Research Service, Arlington, Va.
RATE OF WIDENING OF STRONG-FIELD DOMAIN IN SUPERCRITICALLY DOPED GUNN-EFFECT DEVICES Abstract Only
L. S. Chkhartishvili, Z. N. Chigogidze, and N. P. Khuchua *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 41-42 Transl. into ENGLISH from Radiotekhnika i Elektronika (Moscow, USSR), v. 29, no. 9, Sep. 1984 p 1820-1823 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15595# Joint Publications Research Service, Arlington, Va.
NEW TYPE OF IMPURITY DEFECTS IN SEMIINSULATING GALLIUM ARESENIDE Abstract Only
V. V. Voronkov, G. I. Voronkova, V. P. Kalinushkin, D. I. Murin, E. M. Omelyanovskiy, L. Ya. Pervova, A. M. Prokhorov, and V. I. Raykhshteyn *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 46 Transl. into ENGLISH from Fizika i Tekhnika Poluprovodnikov (Leningrad, USSR), v. 18, no. 8, Aug. 1984 p 1363-1366 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15596# Joint Publications Research Service, Arlington, Va.
PICOSECOND PHOTOCONDUCTIVITY OF INDIUM ARESENIDE Abstract Only
E. Adomaytis, Z. Dobrovolskis, and A. Krotkus *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 46 Transl. into ENGLISH from Fizika i Tekhnika Poluprovodnikov (Leningrad, USSR), v. 18, no. 8, Aug. 1984 p 1422-1424 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

N86-15597# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF RECRYSTALLIZATION AND REDISTRIBUTION OF IMPURITIES IN SEMICONDUCTORS EXPOSED TO MILLISECOND LASER RADIATION Abstract Only
S. G. Kiyak, A. K. Shukhostanov, G. V. Savitskiy, S. Zh. Gonov, and V. V. Gafiychuk *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-006) 30 Apr. 1985 p 47 Transl. into ENGLISH from Fizika i Tekhnika Poluprovodnikov (Leningrad, USSR), v. 18, no. 8, Aug. 1984 p 1446-1448 Original language document was announced as N85-26302 (For primary document see N86-15561 06-33)
Avail: NTIS HC A05/MF A01

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N86-16143 Maryland Univ., College Park.
A DELAYED RANDOM CHOICE QUANTUM MECHANICS EXPERIMENT USING LIGHT QUANTA Ph.D. Thesis
Oleg George Jakubowicz 1984 236 p
Avail: Univ. Microfilms Order No. DA8514538

Wheeler has often articulated during the past seven years several delayed choice Gendanken experiments which are intended to focus attention on the meaning of the elementary quantum phenomenon. Attempts to realize a delayed choice Gendanken xperiment in the spirit John Wheeler's thinking were undertaken. Short laser pulses attenuated to the single photon detection level are introduced into a Mach-Zehnder interferometer one at a time. There is a very fast completely random choice (yes/no) optical switch in one of the arms. Any photons in that arm would be reflected out and into a photomultiplier (PMT) if the optical switch decided to be closed. And any photon in the other arm would have equal probability of going into either of the PMTs that normally monitor interference. If the optical switch chooses to leave the pathway in its arm clear (open) then the photon must split at the beamsplitter and no photons will be detected in the PMT waiting for reflections out of that arm. Additionally, the phase of the interferometer may be set beforehand so that one PMT monitoring interference will register the photon and the other PMT monitoring interference will have zero probability of photon registration. The results are consistent with conventional quantum mechanics even if the decision to block or unblock one arm of the interferometer occurs after the single photon light pulse has passed the entrance beamsplitter of the interferometer. Dissert. Abstr.

N86-16144# Argonne National Lab., Ill.
ANL/STAR PROJECT: A NEW ARCHITECTURE FOR LARGE SCALE THEORETICAL PHYSICS COMPUTATIONS
A. M. Rushton 22 Jun. 1985 6 p Presented at the Computing in High Energy Physics Conference, Hamburg, Germany, 22 Jun. 1985
(Contract W-31-109-eng-38)
(DE85-014988; ANL/HEP-CP-85-64; CONF-8506158-1) Avail: NTIS HC A02/MF A01

The project reported consists of two phases, each of which has goals of substantial physics content on its own. In Phase 1, Star Technologies' ST-100 was selected as the array processor for the prototype coupled system and have installed one on a Vax 11/750 host. The goals with this system are to institute a substantial program in computational physics based on the power provided by this system and thereby to gain experience with both the hardware and software architecture of the ST-100. In Phase 2, a prototype is proposed consisting of two coupled array processors with shared memory to prove that this design can achieve high speed and efficiency in a readily extensible and cost

effective manner. This will implement all of the hardware and software modifications necessary to extend this design to as many as 64 (or more) nodes. The changes made are minimized in the standard system hardware and software; this drastically reduces the effort required to implement such a design. The architecture of the ST-100 is discussed and the physics program. The proposed design of the coupled system is also presented. DOE

N86-16145# Rome Univ. (Italy). Dipt. di Fisica.
CORRECTIONS TO UNIVERSAL SCALING FOR THE 2D NON-LINEAR SIGMA MODEL ON THE LATTICE
M. Falcioni and A. Treves (Instituto Nazionale di Fisica Nucleare, Frascati, Italy) 7 May 1985 4 p refs
(Preprint-460) Avail: NTIS HC A02/MF A01

The first nonuniversal term of the Beta function for the nonlinear sigma-model regularized on a lattice is calculated. This fixes the leading analytic corrections to the universal scaling behavior near the UV fixed point T = 0. The corrections are too small to explain the deviations from the renormalization group behavior observed in Monte Carlo simulations. Author (ESA)

N86-16146# Rome Univ. (Italy). Dipt. di Fisica.
PATH INTEGRAL APPROACH TO BIRTH-DEATH PROCESSES ON A LATTICE
L. Peliti 14 Mar. 1985 53 p refs
(Nota-Interna-843) Avail: NTIS HC A04/MF A01

The Fock space formalism for classical objects is cast in a path integral form and applied to general birth-death processes on a lattice. The introduction of suitable auxiliary variables allows random walks with memory and irreversible aggregation processes to be formulated in a Markovian way, which is treatable in this formalism. Field theories of such processes are recovered in the continuum limit. Implications of the method for their asymptotic behavior are discussed. Author (ESA)

N86-16147# Rome Univ. (Italy). Dipt. di Fisica.
STOCHASTIC THEORY OF EMISSION AND ABSORPTION OF QUANTA
M. Cini and M. Serva 18 Apr. 1985 31 p refs
(Nota-Interna-847) Avail: NTIS HC A03/MF A01

The possibility of constructing a stochastic field theory based on the assumption that for any normal mode of a given classical field, the corresponding action variable becomes a stochastic variable assuming only positive integer values in units of h is discussed. The proposed method reproduces the known properties of simple quantum field theoretical models with no need of probability amplitudes, which are quantities extraneous to classical probability theory. The probability transition rates, for simple states of the field, turn out to be those of simple Poisson processes. Author (ESA)

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N86-16148# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
BRIEF INTRODUCTION TO THE SOVIET CENTRAL RESEARCH INSTITUTE OF AERODYNAMICS
Y. Yongziao and Z. Ruqing 19 Aug. 1985 10 p Transl. into ENGLISH from Lixue Yushijian (China), v. 5, no. 3, 1983 p 57-58
(AD-A159103; FTD-ID(RS)T-0527-85) Avail: NTIS HC A02/MF A01 CSCL 20/4

The Central Research Institute of Aerodynamics is a composite research institute of aerodynamics having major activities on solving various practical problems of aerodynamics in addition to general research activities. Its main objectives are: promote research and development on various problems relating to aerodynamics and fluid dynamics; and, based on research results design department and provide assistance to related industries to solve problems on aerodynamics in research and applications. GRA

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N86-16149# Maryland Univ., College Park. Center for Productivity and Quality of Working Life.
FIELD TEST OF THE METHODOLOGY FOR GENERATING EFFICIENCY AND EFFECTIVENESS MEASURES Final Report, 1 Jul. 1981 - 31 May 1983
T. C. Tuttle, R. E. Wilkinson, and M. D. Matthews Aug. 1985 57 p
(Contract F33615-79-C-0019)
(AD-A158183; AFHRL-TP-84-54) Avail: NTIS HC A04/MF A01 CSCL 14/2

A field test in 24 Air Force organizations, eight each from Administration, Propulsion Maintenance, and Weather, of the methodology for generating efficiency and effectiveness measures (MGEEM) was conducted to evaluate: (1) the number and types of measures developed, (2) the acceptability of the process and its results to participants (e.g., unit commanders), (3) the cost effectiveness of measures in terms of their use of existing data, and (4) the extent to which independent application of the methodology in similar organizations produces similar sets of measures. For each organization, key results areas (KRAs) - categories of intended accomplishments - and quantitative efficiency and effectiveness indicators were developed for each KRA. Results showed that the MGEEM led to a usable number of indicators for each organization; however, there was a much larger percentage of effectiveness (86 to 95 percent) as opposed to efficiency indicators. The MGEEM process and its results were judged very acceptable to participants. The indicators generated were judged cost-effective to implement since approximately 80 - 90 percent made use of existing data. Finally, the indicators were found to have relatively low consistency from organization-to-organization within the three functional areas. Modifications of the MGEEM process are suggested to improve the consistency from site-to-site and to better set the stage for participants. Author (GRA)

N86-16150# Yale Univ., New Haven, Conn. Dept. of Computer Science.
PROBABILISTIC ANALYSIS OF A NETWORK RESOURCE ALLOCATION ALGORITHM. REVISION
N. A. Lynch, N. D. Griffeth, M. J. Fischer, and L. J. Guibas Apr. 1985 47 p
(Contracts N00014-82-K-0154; DAAG29-79-C-0155; DAAK70-79-D-0087; DAAG29-84-K-0058; Grants NSF MCS-79-24370; NSF MCS-81-16678; NSF MCS-82-00854; NSF MCS-83-06854; NSF DCR-83-02391)
(AD-A158970; Yaleu/DCS/TR-418-Rev) Avail: NTIS HC A03/MF A01 CSCL 12/2

A distributed algorithm is presented, for allocating a large number of identical resources (such as airline tickets) to requests which can arrive anywhere in a distributed network. Resources, once allocated, are never returned. The algorithm searches sequentially, exhausting certain neighborhoods of the request origin before proceeding to search at greater distances. Choice of search direction is made nondeterministically. Analysis of expected response time is simplified by assuming that the search direction is chosen probabilistically, that messages require constant time, that the network is a tree with all leaves at the same distance from the root, and that requests and resources occur only at leaves. It is shown that the response time is approximated by the number of messages of one that are sent during the execution of the algorithm, and that this number of messages is a nondecreasing function of the interarrival time for requests. Therefore, the worst case occurs when requests come in so far apart that they are

processed sequentially. The expected time for the sequential case of the algorithm is analyzed by standard techniques. This time is shown to be bounded by a constant, independent of the size of the network. It follows that the expected response time for the algorithm is bounded in the same way. Author (GRA)

N86-15448# Joint Publications Research Service, Arlington, Va.
LAUNCHERS, SATELLITES, MULTINATIONAL PLANS IN 1985 CHES BUDGET
In its West Europe Report: Science and Technology (JPRS-WST-85-024) 13 Aug. 1985 p 1-10 Transl. into ENGLISH from AFP Sciences (Paris), 28 Mar. 1985 p 24-32 (For primary document see N86-15447 06-31)
Avail: NTIS HC A04/MF A01

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N86-16151* NASA Scientific and Technical Information Facility, Baltimore/Washington International Airport, Md. 21240.
NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 1: ABSTRACTS (SUPPLEMENT 26)
Jan. 1985 66 p
(NASA-SP-7039(26)-Sect-1; NAS 1.21:7039(26)-Sect-1) Avail: NTIS HC $10.00 CSCL 05B

Abstracts are provided for 172 patents and patent applications entered into the NASA scientific and technical information system during the period July 1984 through December 1984. Each entry consists of a citation, an abstract, and in most cases, a key illustration selected from the patent or patent application. Author

N86-16152# Committee on Science and Technology (U. S. House).
THE ROLE OF TECHNICAL INFORMATION IN US COMPETITIVENESS WITH JAPAN
Washington GPO 1985 298 p refs Hearings before the Subcommittee on Science, Research and Technology, 99th Congr., 1st Sess., no. 27, 26-27 Jun. 1985
(GPO-51-564) Avail: Subcommittee on Science, Research and Technology

Hearings were held before the U.S. House of Representatives Subcommittee on science, research and technology. The role of technical information in US competetiveness with Japan was discussed. The strength of the US and Japan in selected high technology fields was compared. The shortage of Japanese language experts is attributed as one of the causes of a one way information flow from the US to Japan. The progress made on the availability of Japanese scientific information in the US, and the comparative strength of the US and Japan in selected high technology fields is investigated. E.A.K.

N86-16153# Navy Personnel Research and Development Center, San Diego, Calif.
IMPLEMENTATION OF MULTIFUNCTION INFORMATION SYSTEMS AT THREE NAVY FACILITIES Final Report, Jul. 1982 - Sep. 1983
J. P. Sheposh, V. N. Hulton, S. D. Ramras-Berlin, and T. T. Trinh Jan. 1985 40 p
(AD-A157797; NPRDC-TR-85-17) Avail: NTIS HC A03/MF A01 CSCL 05/1

The accelerated rate of the introduction of office technology systems in both the private and public sectors has had important effects on organizational functioning. In light of the developments and increased usage of this technology, it is important to address issues and problems that arise in the course of implementing these new systems. The objective of this investigation was to evaluate the impact of pilot projects employing multifunction information systems at three Navy facilities. The major aims of the study were to determine: (1) the receptiveness of organizational personnel toward the technological system, (2) pattern of usage of the systems, (3) the major factors impeding and facilitating operation of the system, (4) the impact of the systems on work performance, and (5) the organizational problems and issues associated with the introduction and implementation of the systems. A cross section of civil service personnel (39 support, 44 technical, and 35 managerial) involved with the implementation and/or use of the systems at the three sites was interviewed. The interviews were designed to obtain information about acceptance of the system, usage, system impact on performance, and system implementation problems. The results indicated that resistance to change was not a major problem in the introduction and implementation of these systems. Barriers encountered by members of the organization such as insufficient management commitment and lack of personnel and material resources were more serious problems. GRA

N86-16154# Massachusetts Inst. of Tech., Cambridge. Center for Information Systems Research.
QUEUEING NETWORK SYSTEMS WITH UNBALANCED FLOWS AND THEIR APPLICATIONS TO PERFORMANCE EVALUATION OF HIGHLY PARALLEL DISTRIBUTED INFORMATION SYSTEMS: REVISION
Y. R. Wang and S. E. Madnick Aug. 1984 42 p
(Contract N00039-81-C-0663)
(AD-A158052; CISR-M010-8408-14; CISR-TR-14) Avail: NTIS HC A03/MF A01 CSCL 09/2

A methodology is presented to compute performance measures for distributed information systems with unbalanced flows (i.e., number of transactions leaving a server is not the same as number of transactions entering that server) due to asynchronously spawned parallel tasks--an increasingly important phenomenon in modern information systems which has a significant effect on performance that cannot be analyzed by classical queueing network models. A decomposition method is applied to decompose the unbalanced flows. Formulas for open queueing networks with unbalanced flows due to asynchronously spawned tasks are developed. Furthermore, an algorithm based on Buzen's convolution algorithm is developed to test the necessary and sufficient condition for closed system stability as well as to compute performance measures. An average of less than four iterations is necessary for convergence with this algorithm. A study of the INFOPLEX data storage hierarchy has been conducted using this rapid solution algorithm and detailed simulations; highly consistent results were obtained. A cost effective software tool, using this methodology, has been developed to analyze an architectural design and to produce measures such as throughput, utilization, and response time so that the potential performance problems can be identified. Author (GRA)

N86-16155# Pacific Northwest Lab., Richland, Wash.
ASSURANCE PROGRAM FOR REMEDIAL ACTION (APRA) MICROCOMPUTER-OPERATED BIBLIOGRAPHY MANAGEMENT SYSTEM
R. D. Stenner, D. K. Washburn, and D. H. Denham Jun. 1985 68 p
(Contract DE-AC06-76RL-01830)
(DE85-008763; PNL-5527) Avail: NTIS HC A04/MF A01

Pacific Northwest Laboratory (PNL) provided technical assistance to the Office of Operational Safety (OOS) in developing their Assurance Program for Remedial Action (APRA). The APRA Bibliography Management System (BMS), a microcomputer-operated system designed to file, locate and retrieve project-specific bibliographic data, was developed to manage the documentation associated with APRA. The BMS uses APRABASE, a PNL-developed computer program written in dBASE II language, which is designed to operate using the commercially available dBASE II database software. This document describes the APRABASE computer program, its associated subprograms, and the dBASE II APRA file. A User's Manual is also provided in the

document. Although the BMS was designed to manage APRA-associated documents, it could be easily adapted for use in handling bibliographic data associated with any project. DOE

N86-16156# Oak Ridge Gaseous Diffusion Plant, Tenn.
MODELING NETWORK DATA STRUCTURES IN RELATIONAL-LIKE DATA BASE MANAGEMENT SYSTEMS
G. W. Scott 1985 15 p Presented at the Users Conference, Boston, Massachusetts, 22 Sep. 1985
(Contract DE-AC05-84OT-21400)
(DE85-015803; K/CSD/INF-85-6; CONF-8509235-2) Avail: NTIS HC A02/MF A01

This paper describes the implementation of a data base within the System 1022 environment that successfully models a network data structure. Issues and problems relative to the representation of many-to-many relationships among the data types in relational-like structures are discussed along with alternative solutions. Analysis procedures are described which led to the employment of a special System 1022 file that simulates the role of junction records in networks. A System 1022 data base to assist in the management of CAD/CAM system resources has been developed at Martin Marietta Energy Systems utilizing this concept and is used as a practical example of this approach to data representation. DOE

N86-16157# Sandia National Labs., Albuquerque, N. Mex.
SABIRS: USER REFERENCE AND SYSTEM DOCUMENTATION
R. M. Flaming and J. Bemesderfer Jul. 1985 45 p
(Contract DE-AC04-76DP-00789)
(DE85-016801; SAND-84-7154) Avail: NTIS HC A03/MF A01

The SABIRS is an acronym for Sandia Abbreviated Bibliographic Information Retrieval System. This document is both a reference for users and system documentation which would permit a simple installation in a small or medium sized library on virtually any computer system. DOE

N86-16158# Department of Energy, Washington, D. C. Energy Information Administration.
EPIC/JANUS USER'S GUIDE
Aug. 1985 221 p
(DE85-017027; DOE/NBM-50170/27) Avail: NTIS HC A10/MF A01

EPIC/JANUS, the Energy Information Administration's (EIA) Publication and Interactive Composition System, is a software system that allows text, tables, and graphics to be combined interactively in a single document. It automates the entire process of composition and production of camera-ready copy. EPIC is a machine-independent document management and translation system developed by EIA. JANUS is an interactive document composition system which actually formats and typesets a document. DOE

N86-16159# Los Alamos National Lab., N. Mex.
LOGICAL AND PHYSICAL DATABASE DESIGN WITH A FULL-TEXT ENVIRONMENT
C. D. Michelsen and D. F. Shafer 1985 11 p Presented at the 2nd IEEE International Conference on Data Engineering, Los Angeles, California, 4 Feb. 1985
(Contract W-7405-eng-36)
(DE85-015683; LA-UR-85-2329; CONF-850295-1) Avail: NTIS HC A02/MF A01

This paper describes the problems and solutions encountered in the design of logical and physical data bases within a full-text environment. A full-text environment can be defined as data bases that store both citation information as well as actual document text. The problems/solutions encountered were a result of the necessity to integrate distinct physical data bases into a single logical data base without the assistance of a data base management system that is capable of physical data base integration. DOE

N86-16160# Los Alamos National Lab., N. Mex.
CODE DEVELOPER'S GUIDE TO THE STYX LIAISON LIBRARY: A SOFTWARE INTERFACE FOR ACCESSING AND MANIPULATING STYX OPACITY DATA
G. W. Pfeufer Apr. 1985 103 p
(Contract W-7405-eng-36)
(DE85-014253; LA-10381-M) Avail: NTIS HC A06/MF A01

The Styx Liaison Library (STYXLL) is a new software interface under development on the Cray-1 and Cray X-MP computers at Los Alamos. STYXLL provides standardized techniques for accessing and manipulating gray and multi-group opacity data in Styx format. The first version of STYXLL provides interrogation methods for seeking a list of materials on a random-access Styx opacity file, and for determining the storage parameters of the data defined for these materials. In particular, the query procedures for the opacity files determine, for each requested material sound on the file, the first-word disk address, the number of words, and the internal storage substructure for the DS530 data structure (Rosseland absorption scattering opacities as a function of photon energy and material density and temperature, and Rosseland gray total opacities as a function of material density and temperature). Knowledge of these storage parameters simplifies data acquisition to a set of read specifications from a generic random-access file. A tutorial illustrates the use of the Styx Liaison Library and examines the output from the interrogation of Styx opacity files. DOE

N86-16161# Oak Ridge National Lab., Tenn.
VITAMIN-E 174N,38G GENERAL PURPOSE CROSS-SECTION LIBRARY
R. W. Roussin, J. E. White, and J. L. Bartley 1985 5 p refs Presented at the International Conference on Nuclear Data for Basic Aid and Applied Science, Santa Fe, N. Mex., 13 May 1985
(Contract DE-AC05-84OR-21400)
(DE85-013110; CONF-850507-37) Avail: NTIS HC A02/MF A01

VITAMIN-E, offering a different approach to obtaining multi-group cross sections for a wide range of radiation transport analyses, is now available from RSIC. DOE

N86-15475# Joint Publications Research Service, Arlington, Va.
CALL TO EXPAND INFORMATION NETWORK FOR BASIC RESEARCH
Joachim Kramer *In its* East Europe Report: Science and Technology (JPRS-ESA-85-033) 5 Nov. 1985 p 14-20 refs Transl. into ENGLISH from Das Hochschulwesen (East Berlin, East Germany), v. 33, no. 6, Jun. 1985 p 168-171 (For primary document see N86-15473 06-31)
Avail: NTIS HC A04/MF A01

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N86-16162# Committee on Science and Technology (U. S. House).
NATIONAL SCIENCE FOUNDATION AUTHORIZATION, 1986
Washington GPO 1985 407 p Hearings on H.R. 1210 before the Subcommittee on Science, Research and Technology of the Committee on Science and Technology, 99th Congr., 1st Sess., no. 4, 6, 20-21 Feb. 1985
(GPO-46-945) Avail: Subcommittee on Science, Research and Technology

The U.S. House of Representatives Committee on Science

and Technology held hearings on 1986 National Science Foundation (NSF) authorization. The different scientific programs for which authorization is sought are emphasized. They include education and training in science and engineering, biotechnology, and computers. The following NSF activities are highlighted: (1) mathematical and physical sciences; (2) engineering; (3) biological, behavioral, and social sciences; (4) astronomical, atmospheric, earth and ocean sciences; (5) scientific, technological, and international affairs; and (6) program development and management. E.A.K.

N86-16163# Committee on Commerce, Science, and Transportation (U. S. Senate).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION FOR FISCAL YEAR 1986
Washington GPO 1985 603 p Hearings before the Subcommittee on Science, Technology and Space of the Committee on Commerce, Science and Transportation, 99th Congress, 1st Session, 26 Feb., 27-28 Mar. and 3-4 Apr. 1985
(S-Hrg-99-102; GPO-47-861) Avail: Subcommittee on Science, Technology and Space

A Senate hearing was held and testimony heard relevant to appropriations for NASA. The authorization is for fiscal year 1986. G.L.C.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N86-16164*# Massachusetts Inst. of Tech., Cambridge. Automotive Lab.
A COMPUTER SIMULATION OF THE TURBOCHARGED TURBO COMPOUNDED DIESEL ENGINE SYSTEM: A DESCRIPTION OF THE THERMODYNAMIC AND HEAT TRANSFER MODELS Final Report
Dennis N. Assanis, Jack E. Ekchian, Rich M. Frank, and John B. Heywood Aug. 1985 106 p refs
(Grant NAG3-340; Contract DE-AI01-80CS-50194)
(NASA-CR-174971; DOE/NASA/0340-1; NAS 1.26:174971) Avail: NTIS HC A06/MF A01 CSCL 13F

A computer simulation of the turbocharged turbocompounded direct-injection diesel engine system was developed in order to study the performance characteristics of the total system as major design parameters and materials are varied. Quasi-steady flow models of the compressor, turbines, manifolds, intercooler, and ducting are coupled with a multicylinder reciprocator diesel model, where each cylinder undergoes the same thermodynamic cycle. The master cylinder model describes the reciprocator intake, compression, combustion and exhaust processes in sufficient detail to define the mass and energy transfers in each subsystem of the total engine system. Appropriate thermal loading models relate the heat flow through critical system components to material properties and design details. From this information, the simulation predicts the performance gains, and assesses the system design trade-offs which would result from the introduction of selected heat transfer reduction materials in key system components, over a range of operating conditions. Author

N86-16165*# General Electric Co., Philadelphia, Pa. Space Systems Div.
CERAMIC AUTOMOTIVE STIRLING ENGINE STUDY Final Report
S. Musikant, W. Chiu, D. Darooka, D. M. Mullings, and C. A. Johnson Jan. 1985 373 p refs
(Contracts DEN3-312; DE-AI01-85CE-50112)
(NASA-CR-174907; DOE/NASA/0312-1; NAS 1.26:174907) Avail: NTIS HC A16/MF A01 CSCL 13F

A conceptual design study for a Ceramic Automotive Stirling Engine (CASE) is performed. Year 1990 structural ceramic technology is assumed. Structural and performance analyses of the conceptual design are performed as well as a manufacturing and cost analysis. The general conclusions from this study are that such an engine would be 10-26% more efficient over its performance map than the current metal Automotive Stirling Reference Engine (ASRE). Cost of such a ceramic engine is likely to be somewhat higher than that of the ASRE but engine cost is very sensitive to the ultimate cost of the high purity, ceramic powder raw materials required to fabricate high performance parts. When the design study is projected to the year 2000 technology, substantinal net efficiency improvements, on the order of 25 to 46% over the ASRE, are computed. Author

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N86-16166# Michigan Univ., Ann Arbor. Dept. of Physics.
THE DETECTION OF FAINT SPACE OBJECT WITH SOLID STATE IMAGE DETECTORS Final Technical Report, 1 Jan. 1980 - 31 Jan. 1985
D. J. Hegyi 19 Mar. 1985 17 p
(Grant AF-AFOSR-0095-80)
(AD-A158594; AFOSR-85-0389TR) Avail: NTIS HC A02/MF A01 CSCL 03/1

The primary focus of research during this funding period has been to obtain information with the highest signal-to-noise ratio from faint astronomical sources using a charge-coupled device (CCD). The starting point of the investigation was to determine the optimal sampling function for CCDs considering the noise spectrum characteristics of real devices; the noise spectrum of most CCDs can be accurately described by a combination of 1/f and white noise. Then, a CCD system was constructed so that all operating parameters could be easily adjusted. Some unexpected improvements in performance were obtained by optimizing the operating temperature and increasing the number of electrode voltages which could be independently set compared to other CCD systems. The next phase of the investigation was to develop an image processing system to extract, in a statistically correct way, as much information as possible from astronomical images. The system was then applied to problems ranging from speckle interferometry to global cosmological tests including an investigation to determine the nature of the dark matter in the halos of spiral galaxies. GRA

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N86-16167*# National Science Foundation, Washington, D.C.
ANTARCTIC METEORITE NEWSLETTER, VOLUME 8, NUMBER 2
Aug. 1985 64 p refs Sponsored in part by NSF
(NASA-CR-176401; NAS 1.26:176401) Avail: NTIS

HC A04/MF A01 CSCL 03B

Requests for samples are welcomed from research scientists of all countries, regardless of their current state of funding for meteorite studies. All sample requests will be reviewed by the Meteorite Working Group (MWG), a peer-review committee that guides the collection, curation, allocation, and distribution of the U.S. Antarctic meteorites. Issurance of samples does not imply a commitment by any agency to fund the proposed research. Requests for financial support must be submitted separately to the appropriate funding agencies. As a matter of policy, U.S. Antarctic meteorites are the property of the National Science Foundation and all allocations are subject to recall. Author

N86-16168# London Univ. (England). School of Mathematical Sciences.

BLACK HOLES, PREGALACTIC STARS AND THE DARK MATTER PROBLEM

B. J. Carr Jun. 1985 40 p refs Prepared in cooperation with Fermi National Accelerator Lab., Batavia, Il.

(Contract DE-AC02-76CH-03000)

(DE85-015385; FNAL/C-85/86-A) Avail: NTIS HC A03/MF A01

We review the different ways in which black holes might form and discuss their various astrophysical and cosmological consequences. We then consider the various constraints on the form of the dark matter and conclude that black holes could have a significant cosmological density only if they are of primordial origin or remnants of a population of pregalactic stars. This leads us to discuss the other cosmological effects of primordial black holes and pregalactic stars. DOE

N86-16169# Sandia National Labs., Albuquerque, N. Mex.

SEARCH FOR POSITRON ANNIHILATION LINE AND CONTINUUM RADIATION FROM THE GALACTIC CENTER

C. J. MacCallum and M. Leventhal 1985 5 p Presented at the 19th International Cosmic Ray Conference, La Jolla, California, 11 Aug. 1985 Prepared in cooperation with Bell Labs., Murray Hill, N.J.

(Contract DE-AC04-76DP-00789)

(DE85-013964; SAND-85-1295C; CONF-850883-5) Avail: NTIS HC A02/MF A01

Our balloon-borne germanium (GAMMA)-ray telescope was flown over Alice Springs, Australia, on 1984 November 20 search for the 511 keV positron annihilation line from the Galactic Center. The measured line flux at Earth was (0.6 +- 4.4) x 10 to the minus 4 power photons per square centimeter per second indicating that the source was still in a low or off state. DOE

N86-16170# York Coll., Jamaica, N. Y.

COSMOGENIC NEUTRON-CAPTURE-PRODUCED NUCLIDES IN STONY METEORITES

M. S. Spergel, R. C. Reedy, O. W. Lazareth, and P. W. Levy 1985 55 p refs Presented at the 16th Lunar and Planetary Sciences Conference, Bordeaux, 16 Jul. 1985 Prepared in cooperation with Los Alamos National Lab., N. Mex.

(Contract W-7405-eng-36)

(DE85-012689; LA-UR-85-1545; CONF-850760-1) Avail: NTIS HC A04/MF A01

The distribution of neutrons with energies below 15 MeV in spherical stony meteoroids is calculated using the ANISN neutron-transport code. The source distributions and intensities of neutrons are calculated using cross sections for the production of tritium. The meteoroid's radius and chemical composition strongly influence the total neutron flux and the neutron energy spectrum, while the location within a meteoroid only affects the relative neutron intensities. Meteoroids need to have radii of more than 50 g/sq cm before they have appreciable fluxes of neutrons near thermal energies. Meteoroids with high hydrogen or low iron contents can thermalize neutrons better than chondrites. Rates for the production of Co-60, Ni-59, and Cl-36 are calculated with evaluated neutron-capture cross sections and neutron fluxes determined for carbonaceous chondrites with high hydrogen contents, L-chondrites, and aubrites. For most meteoroids with radii < 300 g/sq cm, the production rates of these neutron-capture nuclides increase monotonically with depth. The highest calculated Co-60 production rate in an ordinary chondrite is 375 atoms/(min g-Co) at the center of a meteoroid with a 250 g/sq cm radius. The production rates calculated for spallogenic Co-60 and Ni-59 are greater than the neutron-capture rates for radii less than approx. 50-75 g/sq cm. Only for very large meteoroids and chlorine-rich samples is the neutron-capture production of Cl-36 important. DOE

N86-16171# Mound Lab., Miamisburg, Ohio.

PRECESSIONS OF THE EARTH AND THE BOHR ATOM

K. C. Jordan Jul. 1985 34 p

(Contract DE-AC04-76DP-00053)

(DE85-015612; MLM-3276) Avail: NTIS HC A03/MF A01

An alternative equation to the tidal theory equations of the precession of the Earth is developed. The new equation yields the correct lunisolar secular precession of 50.3" of arc/yr and has a variable solar component that explains the annual and semiannual variations in the Earth's rotation. The calculated effect of the lunar perigee on excess length of day (l.o.d.) agrees with observations on average l.o.d. during 313 lunar perigees. The l.o.d. values for each day from 1956 to 1979 were calculated from data obtained from the US Naval Observatory. The equation can be applied to the Bohr hydrogen atom and predicts that the electron will counterprecess at the orbital frequency in the first Bohr orbit, and at one-fourth the orbital frequency in the second Bohr orbit. DOE

N86-16172# Lawrence Livermore National Lab., Calif.

STELLAR CORE COLLAPSE AND SUPERNOVA

J. R. Wilson, R. Mayle, S. E. Woosley, and T. A. Weaver Apr. 1985 47 p refs Presented at the 12th Texas Symposium of Relativistic Astrophysics, Jerusalem, 17 Dec. 1984

(Contract W-7405-eng-48)

(DE85-017398; UCRL-92510; CONF-841238-1) Avail: NTIS HC A03/MF A01

Massive stars that end their stable evolution as their iron cores collapse to a neutron star or black hole have long been considered good candidates for producing Type 2 supernovae. For many years the outward propagation of the shock wave produced by the bounce of these iron cores has been studied as a possible mechanism for the explosion. For the most part, the results of these studies have not been particularly encouraging, except, perhaps, in the case of very low mass iron cores or very soft nuclear equations of state. The shock stalls, overwhelmed by photodisintegration and neutrino losses, and the star does not explode. More recently, slow late time heating of the envelope of the incipient neutron star has been found to be capable of rejuvenating the stalled shock and producing an explosion after all. The present paper discusses this late time heating and presents results from numerical calculations of the evolution, core collapse, and subsequent explosion of a number of recent stellar models. For the first time they all, except perhaps the most massive, explode with reasonable choices of input physics. DOE

N86-16173# Los Alamos National Lab., N. Mex.

POSSIBILITIES AT LAMPF FOR STUDYING NUCLEI OF ASTROPHYSICAL INTEREST

W. L. Talbert, Jr. and M. E. Bunker 1985 6 p Presented at TRIUMPF Accelerated Radioactive Beams Workshop, Parksville, British Columbia, 4 Sep. 1985

(Contract W-7405-eng-36)

(DE85-017526; LA-UR-85-3098; CONF-8509148-1) Avail: NTIS HC A02/MF A01

Nuclear data needs in astrophysics range from neutron capture cross sections of a number of stable or near-stable nuclei to decay and neutron binding-energy data for highly neutron-rich nuclei. LAMPF has the potential to contribute significantly to these needs. The new Los Alamos Neutron Scattering Center (LANSCE, aka WNR/PSR) offers world-class capabilities for neutron capture studies up to a MeV or so. The study of nuclei far from stability could be extended into some regions of astrophysical interest using a proposed HE-jet coupled mass separator system with a

target/production chamber in the LAMPF beam stop area. Specific examples of possible studies at each facility are presented. DOE

N86-16174# Lick Observatory, Santa Cruz, Calif.
THEORETICAL MODELS FOR TYPE 1 AND TYPE 2 SUPERNOVA
S. E. Woosley and T. A. Weaver 1985 28 p refs Presented at the 20th Recontre de Moriond, Les Arcs, France, 10 Mar. 1985 Prepared in cooperation with California Univ., Lawrence Livermore Lab.
(Contract W-7405-eng-48)
(DE85-016288; UCRL-92972; CONF-850375-19) Avail: NTIS HC A03/MF A01

Recent theoretical progress in understanding the origin and nature of Type I and Type II supernovae is discussed. New Type II presupernova models characterized by a variety of iron core masses at the time of collapse are presented and the sensitivity to the reaction rate (12)C((ALPHA), (GAMMA)) (16)O explained. Stars heavier than about 20 M (sub solar) must explode by a delayed mechanism not directly related to the hydrodynamical core bounce and a subset is likely to leave black hole remnants. The isotopic nucleosynthesis expected from these massive stellar explosions is in striking agreement with the Sun. Type I supernovae result when an accreting white dwarf undergoes a thermonuclear explosion. The critical role of the velocity of the deflagration front in determining the light curve, spectrum, and, especially, isotopic nucleosynthesis in these models is explored. DOE

N86-16175# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
COSMOGONIC SCENARIO
H. Alfven and G. Arrhenius May 1985 17 p refs
(TRITA-EPP-85-04; ISSN-0348-7539) Avail: NTIS HC A02/MF A01

A cosmogonic scenario, based on the fact that the Saturnian C ring and essential features of the B and A rings agree with the plasma cosmogony approach with an accuracy of 1% or better, and on the likely evolution of the solar system is proposed. This outlines the evolution of an interstellar cloud and the formation of stars surrounded by solar nebulae under the combined action of gravitational and electromagnetic forces. Matter falling in from the solar nebula towards the Sun is processed by electromagnetic processes and a plasma-planetesimal transition occurs. Planetesimals accrete to planets, and around planets the same process in miniature leads to the formation of satellites. The origin of comets is discussed. Author (ESA)

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

N86-16176# Los Alamos Scientific Lab., N. Mex.
USE OF CHEMICAL EXPLOSIVES FOR EMERGENCY SOLAR FLARE SHELTER CONSTRUCTION AND OTHER EXCAVATIONS ON THE MARTIAN SURFACE
R. D. Dick, J. D. Blacic, and D. R. Pettitt 1985 15 p Presented at the Manned Mars Mission Workshop, Huntsville, Ala., 10 Jun. 1985
(Contract W-7405-eng-36)
(DE85-014131; LA-UR-85-1990; CONF-8506149-1) Avail: NTIS HC A02/MF A01

The necessity to shelter people on the Martian surface from solar flare particles at short notice and the need for long-term habitats with thick cosmic ray shielding suggests that explosives could be used effectively for excavation of such structures. Modern insensitive high explosives are safe, efficient, and reliable for rock breakage and excavation. Extensive Earth-bound experience leads us to propose several strategies for explosively-constructed shelters based on tunneling, cratering, and rock casting techniques. DOE

N86-16177*# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
FURTHER EXPLORATIONS OF COSMOGONIC SHADOW EFFECTS IN THE SATURNIAN RINGS
H. Alfven, I. Axnaes, N. Brenning, and P.-A. Lindqvist 1985 35 p refs Sponsored by NASA, Swedish Natural Science Research Council and National Science Foundation
(NASA-CR-176441; NAS 1.26:176441; TRITA-EPP-85-03; ISSN-0348-7539) Avail: NTIS HC A03/MF A01 CSCL 20I

The mass distribution in the Saturnian ring system is compared with predictions from the cosmogonic theory of Alfven and Arrhenius (1975) in which matter in the rings was once a magnetized plasma, with gravitation balanced by centrifugal force and by the magnetic field. As the plasma is neutralized, the magnetic force disappears and the matter can be shown to fall in to a distance 2/3 of the original. This supports the cosmogonic shadow effect, also demonstrated for the astroidal belt and in the large scale structure of the Saturnian ring system. The relevance of the comogonic shadow effect for parts of the finer structures of the Saturnian ring system is investigated. It is shown that many structures of the present ring system can be understood as shadows and antishadows of cosmogonic origin. These appear in the form of double rings centered around a position a factor 0.64 (slightly $< 2/3$) closer to Saturn than the causing feature. Author (ESA)

N86-15510# Joint Publications Research Service, Arlington, Va.
VENUS-15, VENUS-16 SYNTHETIC APERTURE RADAR ON VENUS SATELLITE ORBIT Abstract Only
A. F. Bogomolov, N. V. Zherikhin, and G. A. Sokholov *In its* USSR Report: Electronics and Electrical Engineering (JPRS-UEE-85-011) 24 Oct. 1985 p 71 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radiofizika (Gorkiy, USSR), v. 28, no. 3, Mar. 1985 p 259-274 Original language document was announced in IAA as A85-34876 (For primary document see N86-15484 06-31)
Avail: NTIS HC A05/MF A01

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N86-16178# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SHORT-LIVED SOLAR BURST SPECTRAL COMPONENT AT APPROXIMATELY < 100 GHz
P. Kaufmann, E. Correia, J. E. R. Costa, and A. M. Zodi Vaz Jun. 1985 11 p refs Sponsored in part by FINEP Submitted for publication
(INPE-3550-PRE/762) Avail: NTIS HC A02/MF A01

A new kind of burst emission component was discovered, exhibiting fast and distinct pulses (approx. 60 ms durations), with spectral peak emission at f approx. $>$ 100 GHz, and onset time coincident to hard X-rays to within approx. $<$ 128 ns. These features pose serious constraints for the interpretation using current models. One suggestion assumes the f approx. $>$ 100 GHz pulses emission by synchrotron mechanism of electrons accelerated to ultrarelativistic energies. The hard X-rays originate from inverse Compton scattering of the electrons on the synchrotron photons. Several crucial observational tests are needed for the understanding of the phenomenon, requiring high sensitivity and high time resolution (approx. 1 ms) simultaneous to high spatial resolution ($<$ 0.1 arcsec) at f approx. $>$ 110 GHz and hard X-rays. Author

N86-16179# National Center for Atmospheric Research, Boulder, Colo.

SOLAR CORONAL WHITE LIGHT, Fe 10, Fe 14 AND Ca 15 OBSERVATIONS DURING 1984: AN ATLAS OF SYNOPTIC CHARTS

D. G. Sime, R. R. Fisher, and R. C. Altrock Mar. 1985 77 p refs Sponsored in part by NSF

(PB85-191013; NCAR/TN-251/STR) Avail: NTIS HC A05/MF A01 CSCL 03B

Synoptic observations of the solar corona in white light and in three emission lines (CaXV at 5964 A, FeXIV at 5303 A, and Fe X at 6374 A) were carried out during most of 1984 at the High Altitude Observatory's Mauna Loa Solar Observatory and at Sacramento Peak Observatory. These observations were partly in support of the scientific program of the repaired SMM spacecraft. The observations provide a record of the distribution and brightness of the hotter regions of the corona over the year. The authors present these data in the form of synoptic maps for each rotation during the year for the purpose of providing a context for the investigations which are to take place during the Joint Study of Coronal and Prominence Plasmas organized by Goddard Space Flight Center/NASA. In this way, they propose both to describe the data coverage achieved and summarize the large scale properties of the corona in this late descending phase of the solar cycle. GRA

N86-16180# National Center for Atmospheric Research, Boulder, Colo.

WHITE LIGHT SOLAR CORONA: AN ATLAS OF 1984 K-CORONAMETER SYNOPTIC CHARTS, DECEMBER 1983 - JANUARY 1985

R. Fisher, C. Garcia, E. Lundin, P. Seagraves, and D. Sime Mar. 1985 78 p refs Sponsored in part by NSF

(PB85-191021; NCAR/TN-246/STR) Avail: NTIS HC A05/MF A01 CSCL 03B

The synoptic observing project of the High Altitude Observatory's Coronal Dynamics Project began on 5 August 1980. The data obtained by the Mark-3 K-coronameter located at the Mauna Loa Solar Observatory, Hawaii, are published yearly in volumes of the White Light Solar Corona: An Atlas of K-coronameter Synoptic Charts. The reader will notice a segment of overlapped data at both the beginning and the end of each volume. This is necessary to provide a complete data set of Carrington rotations covering a specific time period because west limb passage occurs 14 days after east limb passage. This set of synoptic data should be regarded as a preliminary presentation in which no corrections have been made for the day-to-day variations in sky transmission and scattering of polarized light by the Earth's atmosphere. Author (GRA)

N86-16181# National Geophysical Data Center, Boulder, Colo.

SOLAR-GEOPHYSICAL DATA NUMBER 486, FEBRUARY 1985. PART 1 (PROMPT REPORTS): DATA FOR JANUARY 1985, DECEMBER 1984 AND LATE DATA

H. E. Coffey Feb. 1985 105 p 4 Vol.

(PB85-196715; SGD-586-Pt-1) Avail: NTIS HC A06/MF A01 CSCL 03B

Solar geophysics data is presented. Topics include the following: detailed index for 1984 to 1985; data for January 1985 - UWDS alert periods (Advance and world-wide, solar activity indices, solar flares, solar radio emission, inferred interplanetary magnetic field polarity. Mean solar magnetic field); data for December 1984 - (solar active regions, sudden ionospheric disturbances, solar radio spectral observations, cosmic ray measurements by neutron monitor, geomagnetic indices, radio propagation indices); late data - (solar radio emission December 1984, Pioneer XII interplanetary magnetic field magnitudes, geomagnetic indices November 1984, Interplanetary scintillation measurements of solar wind, cosmic rays August-November 1984 climax, huancayo, errata-cosmic rays, climax June 1984). GRA

N86-16182# National Geophysical Data Center, Boulder, Colo.

SOLAR-GEOPHYSICAL DATA NUMBER 586, FEBRUARY 1985. PART 2 (COMPREHENSIVE REPORTS). DATA FOR AUGUST 1984, MARCH - JUNE 1982 AND MISCELLANEA

H. E. Coffey Feb. 1985 158 p 4 Vol.

(PB85-196723; SGD-486-Pt-2) Avail: NTIS HC A08/MF A01 CSCL 03B

Solar geophysical data is presented. Topics include the following: detailed index for 1984-1985; data for August 1984 - (meudon carte synoptique, solar radio bursts at fixed frequencies, solar x-ray radiation from GOES satellite, mass ejections from the Sun, active prominences and filaments); data for March, April, May, June 1982 - (Solar flares March 1982, solar flares April 1982, solar flares May 1982, solar flares June 1982, number of flares August 1966 - June 1982). GRA

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N86-16183# Lawrence Livermore National Lab., Calif.

EMISSION REGION OF GAMMA RAY BURSTS

E. P. Liang May 1985 6 p Presented at the 19th International Cosmic Ray Conference, La Jolla, Calif., 11 Aug. 1985

(Contract W-7405-eng-48)

(DE85-013198; UCRL-92734; CONF-850883-2) Avail: NTIS HC A02/MF A01

Within the last few years the years the rapid accumulation of gamma ray burst spectral data, especially those of KONUS and SMM, has made the confrontation between theories of the gamma ray emission mechanisms and observations much more urgent and challenging. At present the most viable model seems to be some combination of inverse Comptonization and sychrotron emission. In this paper we limit the acceptable parameter space of the emission region by taking into account the maximum set of observation constraints. We then apply these to two specific scenarios: surface emission versus magnetospheric emission and consider some observable predictions based on these scenarios. DOE

N86-16184# Los Alamos National Lab., N. Mex.

RECURRENT POPULATION 2 X-RAY TRANSIENTS - SIMILARITIES TO SU UMa CATACLYSMIC VARIABLES

W. Priedhorsky 1985 11 p refs Presented at the 9th North American Workshop on Cataclysmic Variables, Seattle, 24 Jun. 1985

(Contract W-7405-eng-36)

(DE85-014075; LA-UR-85-2252; CONF-8506143-1) Avail: NTIS HC A02/MF A01

Quasi-periodic outburst activity is not uncommon among Population 2 X-ray binaries. This paper reports observations of such activity in several sources, made by the Vela 5B X-ray monitor. Typical periods are 1/2 to 2 years with an rms scatter in interval time of approx. 10%. This activity is reminiscent of the superoutburst cycles of SU UMa CV's with respect to mean recurrence times, the variation of the recurrence times about their mean, and the total mass transferred during outburst. However, the outbursts in the X-ray sources have substantially longer duration, 50 to 100 days instead of approx. 10 days. The author suggests that SU UMa and X-ray transient outbursts may be caused by similar mass-transfer instabilities. DOE

99 GENERAL

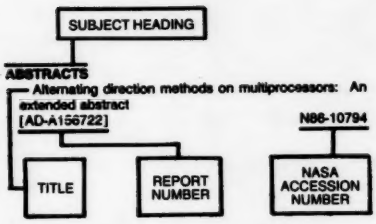
N86-16185*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

SEARCHING THE HORIZON: A HISTORY OF AMES RESEARCH CENTER, 1940-1976

Elizabeth A. Muenger 1985 314 p refs
(NASA-SP-4304; NAS 1.21:4304) Avail: NTIS MF A01; SOD HC $13.00 as 033-000-0096-6 CSCL 05D

A history of the Ames Research Center from 1940 to 1976 is presented. The evolution and some of the facility's accomplishments are recounted. G.L.C.

Typical Subject Index Listing



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A

ABSORBENTS
Predictive models for gaseous-phase carbon adsorption and humidity effects on trichloroethylene adsorption
[AD-A159167] N86-15367

ABSORBERS (EQUIPMENT)
Solar rocket absorber
[AD-D011897] N86-15336

ABSORBERS (MATERIALS)
Predictive models for gaseous-phase carbon adsorption and humidity effects on trichloroethylene adsorption
[AD-A159167] N86-15367

ABSORPTANCE
Predictive models for gaseous-phase carbon adsorption and humidity effects on trichloroethylene adsorption
[AD-A159167] N86-15367

ABSORPTION CROSS SECTIONS
Vitamin-E 174N,38G general purpose cross-section library
[DE85-013110] N86-16161

Cosmogenic neutron-capture-produced nuclides in stony meteorites
[DE85-012689] N86-16170

ABSORPTIVITY
Development of radiative cooling materials, phase 3
[DE85-014666] N86-15404

ABSTRACTS
Summaries of Center for Fire Research grants and in-house programs, 1985
[NBSIR-85-3258] N86-15429

ABUNDANCE
Tables of masses, binding energies, half-lives and natural abundances
[DE85-016344] N86-16061

ACCELERATED LIFE TESTS
Investigations of the relations between the damage evolution of vibrationally loaded samples and the measuring quantities of the instrumented accelerated fatigue test during the crackfree fatigue phase and microcrack formation phase N86-15694

ACCELERATION PROTECTION
Programming a multiple-orifice hydraulic decelerator
[AD-A159428] N86-15328

ACCELERATION TOLERANCE
Oxygenation and regional circulation in gingival mucosal tissues under effect of head-to-pelvis (+Gz) accelerations N86-15872

ACCEPTABILITY
Field test of the methodology for generating efficiency and effectiveness measures
[AD-A158183] N86-16149

ACCURACY
Accuracy of polynomial approximation of quasi-minimax methods N86-15427

An examination of some error correcting techniques for continuous speech recognition technology
[AD-A158001] N86-15521

ACETATES
Reactions of singlet oxygen with enol esters
[AD-A159160] N86-15342

ACID RAIN
Controlling acidic deposition: Targeted strategies for reducing sulfur dioxide emissions
[DE85-015058] N86-15742

Proposals for acid-rain control from the 98th Congress
[DE85-015268] N86-15744

ACIDS
The catalytic activity and selectivity of chemical treated clinoptilolite in the conversion of methanol N86-15424

ACOUSTIC EMISSION
Ultrasonic measurement of particles in a viscous fluid
[AD-A158989] N86-16046

ACOUSTIC EXCITATION
Experimental investigation of acoustic wave electrical excitation in electrolyte solution N86-15621

Investigation of large scale structures in a subsonic free jet
[DFVLR-FB-85-38] N86-15644

ACOUSTIC MEASUREMENT
Location of noise sources using a phase-slope method
[NASA-TP-2505] N86-16041

Ultrasonic measurement of particles in a viscous fluid
[AD-A158989] N86-16046

Thin superconducting film characterization by surface acoustic waves
[AD-A158311] N86-16127

ACOUSTIC PROPERTIES
Informativeness of echo signal in pulsed ultrasonography of the brain (with use of model) N86-15887

Optimum frequency for propagation of sound in shallow sound channels
[AD-A159064] N86-16047

Arctic Ocean background noise caused by ridging of sea ice
[AD-A159587] N86-16050

ACOUSTIC SCATTERING
Theoretical studies in nondestructive evaluation (NDE)
[AD-A159155] N86-15682

Description, analysis, and prediction of sea-floor roughness using spectral models
[AD-A158000] N86-15846

The experimental investigation of the inverse problem in rough surface scattering of acoustic waves
[AD-A158070] N86-16044

ACOUSTIC SOUNDING
Nondestructive ultrasonic characterization of engineering materials
[NASA-CR-176349] N86-15680

Description, analysis, and prediction of sea-floor roughness using spectral models
[AD-A158000] N86-15846

Estimation of the trajectory parameters of an accelerationless target from angle measurements of a single, stationary, acoustic sensor. Error sources and their influence
[REPT-12-84] N86-16039

ACOUSTIC VELOCITY
Experimental investigation of acoustic wave electrical excitation in electrolyte solution N86-15621

Localization of buried objects in water-saturated sand by variable incidence acoustic pulse reflections
[AD-A158064] N86-16043

ACOUSTICS
Design considerations for application of laminar flow control systems to transport aircraft N86-15270

China report: Science and technology
[JPRS-CST-85-038] N86-15438

China report: Science and technology
[JPRS-CST-85-040] N86-15478

Visibility of noise in homogeneous and textured areas
[FOA-C-50010-H2] N86-15536

Acoustical imaging system evaluation
[AD-A159425] N86-15684

Localization of buried objects in water-saturated sand by variable incidence acoustic pulse reflections
[AD-A158064] N86-16043

Thin superconducting film characterization by surface acoustic waves
[AD-A158311] N86-16127

ACOUSTO-OPTICS
Acoustooptic demodulator of phase-keyed signals N86-15622

Large memory acousto-optically addressed pattern recognition
[AD-D011861] N86-16092

ACTIVATED CARBON
Predictive models for gaseous-phase carbon adsorption and humidity effects on trichloroethylene adsorption
[AD-A159167] N86-15367

ACTIVE CONTROL
The use of active controls to augment rotor/fuselage stability N86-15281

An algorithm for active adaptive control of periodic interference
[AD-A156651] N86-16052

ACTIVITY (BIOLOGY)
A review of biological processes within oceanic water columns relevant to the assessment of the safety of disposal of waste, notably radioactive isotopes, on or within the seabed
[IOS-198] N86-15745

ADA (PROGRAMMING LANGUAGE)
KBEmacs (Knowledge-Based Editor in emacs): A step toward the programmer's apprentice
[AD-A157814] N86-15948

Ada (trade name) compiler validation summary report: Rational environment, version A.2.0.6 for rational R1000
[AD-A157830] N86-15949

Practical guidelines for testing Ada programs
[AD-A158099] N86-15951

Representing time and space in an object oriented hardware description language
[AD-A158226] N86-15952

ADAPTATION
Research in adaptive beamforming for satellite communications
[AD-A157828] N86-15520

Investigation of catecholamine metabolism at high altitudes N86-15880

ADAPTERS
Adapter pallet system
[AD-D011858] N86-15671

ADDING CIRCUITS
Power combinations microwave amplifier loading characteristics N86-15610

ADDITIVES
Predicting and diagnosing performance of transistors, integrated circuits and large-scale-integration systems by multilevel simulation methods and programs N86-15487

Structural transformations in semiconductors during optical pumping N86-15490

ADIABATIC CONDITIONS
Response of the mesoscale atmosphere to diabatic heating N86-15794
Mesoscale ageostrophic circulations associated with baroclinic jet streaks N86-15795
The parameters of adiabatic rapid passage in the 0-0 hyperfine transition of Rb-87
[AD-A158562] N86-16056
ADIABATIC EQUATIONS
Adiabatic invariant value variation under shortwave band subcritical conditions N86-15572
ADSORPTION
USSR report: Chemistry
[JPRS-UCH-85-013] N86-15344
ADVECTION
Response of the mesoscale atmosphere to diabatic heating N86-15794
Dynamics and structure of Gulf Stream meanders northeast of Cape Hatteras, N.C. N86-15841
AERIAL PHOTOGRAPHY
A comparison of LANDSAT TM to MSS imagery for detecting submerged aquatic vegetation in lower Chesapeake Bay N86-15707
AERODYNAMIC CHARACTERISTICS
The experimental determination of the subsonic aerodynamic characteristics of an Ogive-Cylinder body including a comparison with theoretical estimates, volume 1
[CAR-8509] N86-15242
AERODYNAMIC CONFIGURATIONS
Test cases for inviscid flow field methods
[AGARD-AR-211] N86-15256
Numerical solutions for three-dimensional cases: Swept wings N86-15263
Aircraft drag reduction technology: A summary N86-15267
Parasitic and interference drag prediction and reduction N86-15272
Ground resonance analysis using a substructure modeling approach N86-15282
AERODYNAMIC DRAG
Parasitic and interference drag prediction and reduction N86-15272
AERODYNAMIC INTERFERENCE
DFVLR develops new kind of walls or wind tunnel N86-15446
AERODYNAMIC LOADS
Rotorcraft Dynamics 1984
[NASA-CP-2400] N86-15280
Restructuring the rotor analysis program C-60 N86-15292
AERODYNAMIC STABILITY
Rotorcraft Dynamics 1984
[NASA-CP-2400] N86-15280
Parametric study of the aeroelastic stability of a bearingless rotor N86-15283
Development of an unsteady aerodynamics model to improve correlation of computed blade stresses with test data N86-15288
AERODYNAMIC STALLING
Separated transonic airfoil flow calculations with a nonequilibrium turbulence model
[NASA-TM-86830] N86-15247
Aircraft accident report: Vieques Air Link, Inc., Britten-Norman BN-21-6 Islander, N589SA, Vieques, Puerto Rico, August 2, 1984
[PB85-901408] N86-15276
Resonant cavities for stall recovery in gas turbine engines
[AD-D011891] N86-15317
AERODYNAMICS
Early transonic ideas in the light of later developments
[AD-A159101] N86-15250
Development and application of a time-history analysis for rotorcraft dynamics based on a component approach N86-15291
China report: Science and technology
[JPRS-CST-85-040] N86-15478
Computational fluid dynamics at NASA Ames and the numerical aerodynamic simulation program
[NASA-TM-86769] N86-15626
Brief introduction to the Soviet Central Research Institute of Aerodynamics
[AD-A159103] N86-16148
AEROELASTICITY
Parametric study of the aeroelastic stability of a bearingless rotor N86-15283
Aeroelastic considerations for torsionally soft rotors N86-15289
Optimal design application on the advanced aeroelastic rotor blade N86-15290
Influence of various unsteady aerodynamic models on the aeromechanical stability of a helicopter in ground resonance N86-15294
The influence of dynamic inflow and torsional flexibility on rotor damping in forward flight from symbolically generated equations N86-15295
Flap-lag-torsion stability in forward flight N86-15296
Dynamic stability of a bearingless circulation control rotor blade in hover N86-15297
An examination of the relations between rotor vibratory loads and airframe vibrations N86-15299
Prediction of wing aeroelastic effects on aircraft lift and pitching moment characteristics
[NASA-TM-87631] N86-15319
On second propagation in radial fan casings
[DFVLR-FB-85-32] N86-16053
AERONAUTICS
Computational models of human vision with applications
[NASA-CR-176413] N86-15898
AERONOMY
Validation of outgoing longwave radiation in the GLAS (Goddard Laboratory for Atmospheric Sciences) general circulation model
[AD-A158006] N86-15823
AEROSOLS
Procedure for calculating attenuation in and reliability of atmospheric optical data transmission systems N86-15470
Photographic recording of trajectories of aerosol particles by method of multiple exposure N86-15613
Particle sizing with whisker collectors --- flow visualization
[ISL-CO-230/84] N86-15639
Micro-Raman spectroscopy: The analysis of micrometer and submicrometer atmospheric aerosols
[NASA-CR-177964] N86-15756
The optical spectra of aerosols
[AD-A158057] N86-15758
AEROSPACE ENGINEERING
Activities report in aerospace research N86-15240
West Europe report: Science and technology
[JPRS-WST-85-028] N86-15435
West Europe report: Science and technology
[JPRS-WST-85-027] N86-15678
Searching the horizon: A history of Ames Research Center, 1940-1976
[NASA-SP-4304] N86-16185
AEROSPACE ENVIRONMENTS
Studies of molecular properties of polymeric materials: Aerospace environmental effects on three linear polymers
[NASA-TM-87532] N86-15391
Studies of molecular properties of polymeric materials: Aerospace environmental effects on three linear polymers (polymer durability) N86-15392
Radio-frequency electrical properties of some neat and metal-doped polyimides N86-15393
AEROSPACE MEDICINE
USSR report: Space Biology and Aerospace Medicine, volume 19, no. 4, July - August 1985
[JPRS-USB-85-006] N86-15865
Problems of studying flight work in Soviet aviation medicine of the 1920's - 1930's N86-15866
AEROSPACE SCIENCES
Space activities of the United States, Soviet Union and other launching countries/organizations, 1957-1984
[GPO-46-504] N86-15330
AEROSPACE VEHICLES
Fundamental studies on the Aluminum-Lithium-Beryllium alloy system
[AD-A158088] N86-15381
AGRICULTURE
West Europe report: Science and technology
[JPRS-WST-85-015] N86-15443
Biotechnology and agriculture
[GPO-48-672] N86-15712
Image registration N86-15718
AIR
PETROS: A progam for calculating transport of heat, water, water vapor and air through a porous material
[DE85-013168] N86-15972
AIR CONDITIONING
Condensation potential in high thermal performance walls. Hot, humid summer climate
[AD-A158002] N86-15431
AIR CURRENTS
Airborne Doppler measurements of the central California extended sea breeze N86-15791
AIR FLOW
Dynamic response characteristics of a circulation control rotor model pneumatic system N86-15298
AIR JETS
Research into heat transfer by convection in the chamber of a furnace with relation to the angle at which a high velocity jet strikes a plane surface
[BLLD-M-36478-(5828.4)] N86-15624
Heat transfer characteristics within an array of impinging jets. Effects of crossflow temperature relative to jet temperature
[NASA-CR-3936] N86-15625
AIR POLLUTION
Predictive models for gaseous-phase carbon adsorption and humidity effects on trichloroethylene adsorption
[AD-A159167] N86-15367
Controlling acidic deposition: Targeted strategies for reducing sulfur dioxide emissions
[DE85-015058] N86-15742
Capabilities, needs and applications of gaseous tracers
[DE85-015194] N86-15743
Proposals for acid-rain control from the 98th Congress
[DE85-015268] N86-15744
AIR SAMPLING
Collection and analysis of NASA clean room air samples
[NASA-CR-3947] N86-15358
Capabilities, needs and applications of gaseous tracers
[DE85-015194] N86-15743
AIR TRAFFIC CONTROLLERS (PERSONNEL)
Experience and performance in video games and its influence on aptitude tests in aviation psychology
[DFVLR-FB-85-43] N86-15915
AIRBORNE EQUIPMENT
Airborne Doppler measurements of the central California extended sea breeze N86-15791
Airborne Doppler lidar activities N86-15793
AIRCRAFT ANTENNAS
VHF-AM communications equipment selection and installation practices for helicopters
[DOT/FAA/PM-85/8] N86-15518
AIRCRAFT COMMUNICATION
VHF-AM communications equipment selection and installation practices for helicopters
[DOT/FAA/PM-85/8] N86-15518
AIRCRAFT CONFIGURATIONS
Aircraft flight performance methods. Revision 2
[AD-A158227] N86-15310
AIRCRAFT CONSTRUCTION MATERIALS
Studies of molecular properties of polymeric materials: Aerospace environmental effects on three linear polymers
[NASA-TM-87532] N86-15391
Studies of molecular properties of polymeric materials: Aerospace environmental effects on three linear polymers (polymer durability) N86-15392
AIRCRAFT CONTROL
Use of hinged strakes for lateral control at high angles of attack
[AD-A158005] N86-15321
AIRCRAFT DESIGN
Activities report in aerospace research N86-15240
Design considerations for application of laminar flow control systems to transport aircraft N86-15270
Searching the horizon: A history of Ames Research Center, 1940-1976
[NASA-SP-4304] N86-16185
AIRCRAFT ENGINES
Resonant cavities for stall recovery in gas turbine engines
[AD-D011891] N86-15317
AIRCRAFT FUELS
Effects of vibration-induced cavitation of physicochemical characteristics of aircraft fuel N86-15346
Variability of major organic components in aircraft fuels
[AD-A159057] N86-15415
AIRCRAFT HAZARDS
Antimisting kerosene: Development of a continuous 10 GPM in-line blender
[NASA-CR-176432] N86-15412
AIRCRAFT MODELS
Investigation of a supersonic cruise fighter model flow field
[NASA-TM-86361] N86-15248
AIRCRAFT NOISE
Can aircraft noise less than or equal 115 to dBA adversely affect reproductive outcome in USAF women?
[AD-A158322] N86-16045
On second propagation in radial fan casings
[DFVLR-FB-85-32] N86-16053
AIRCRAFT RELIABILITY
The relationship between material failures and flight hours: Statistical considerations
[AD-A159571] N86-15311
AIRCRAFT SAFETY
Antimisting kerosene: Development of a continuous 10 GPM in-line blender
[NASA-CR-176432] N86-15412

AIRCRAFT STABILITY
The use of active controls to augment rotor/fuselage stability N86-15281
Test results from a dynamic model dynaflex rotor N86-15285

AIRCRAFT STRUCTURES
Development and application of a time-history analysis for rotorcraft dynamics based on a component approach N86-15291
Method of calculating angular dimensions of flight vehicle cockpit canopy casings N86-15886

AIRCRAFT WAKES
Recent developments in three-dimensional wake analysis N86-15273

AIRFOIL PROFILES
Numerical solutions for three-dimensional cases: Delta wings N86-15264
Concluding remarks N86-15265

AIRFOILS
Reference test cases and contributors N86-15261
Flutter generator control and force computer [AEL-0242-TM] N86-15318
System engineering and energy cost analysis of small and medium wind turbines [DE85-012159] N86-15738

AIRFRAMES
An examination of the relations between rotor vibratory loads and airframe vibrations N86-15299
Planning, creating and documenting a NASTRAN finite element model of a modern helicopter N86-15300
Coupled rotor-body vibrations with inplane degrees of freedom N86-15301
Adaptation of a modern medium helicopter (Sikorsky S-76) to higher harmonic control N86-15303
Flutter generator control and force computer [AEL-0242-TM] N86-15318
Digital servocontroller system. Volume 2. Maintenance manual [AD-A159066] N86-15322

AIRPORTS
Concepts for the development of a nondestructive testing and evaluation system for rigid airfield pavements [AD-A158004] N86-15324
Climatological data of stations in the Netherlands. No. 24: A climatology of Amsterdam airport for the period 1951 - 1980 [KNMI-150-24] N86-15837

ALCOHOLS
Some effects of alcohol and simulated altitude on complex performance scores and breathanalyzer readings [AD-A158925] N86-15905

ALDOSTERONE
Effect of dry immersion model on parameters of fluid-electrolyte metabolism, blood plasma aldosterone and cortisol levels in individuals differing in body fluid content N86-15875

ALGAE
Investigation of distinctions referable to growth, development and metabolism of Closteriopsis acicularis algae when cells are limited in nitrogen as related to biological life-support systems for man N86-15883
Investigation of mineral nutrition of a new form of microalgae to be used in biological life-support systems N86-15892

ALGORITHMS
Digital servocontroller system. Volume 2. Maintenance manual [AD-A159066] N86-15322
On the assignment algorithm by means of multi-linked data structure N86-15426
Accuracy of polynomial approximation of quasi-minimax methods N86-15427
A new approach to signal registration with the emphasis on variable time delay estimation N86-15514
A variance detector for signal-gap discrimination in noisy speech channels [AD-A159227] N86-15527
Estimating number and parameters of signal components in presence of noise N86-15567
Modular floating decimal point operations for antenna array adaptation N86-15568
Effect of conductor profile on force characteristics due to motion of a magnetic field source N86-15607
Droplet sizing research [AD-A158318] N86-15653
Modal analysis of unstable resonators [AD-A159225] N86-15663
Basic research in reliability for real systems [AD-A159100] N86-15681
Effects of load proportioning on the capacity of multiple-hole composite joints [NASA-CR-178019] N86-15687
Estimation of precipitation from GOES IR imagery during FGGE: Application to diagnostic studies N86-15775
Automatic determination of cardiac output from rheogram of the trunk N86-15889
Variable radix processor [AD-D011893] N86-15918
Specific recommendations for improving network feedback to hosts [AD-A158768] N86-15924
Modeling problem-oriented multiprocessor systems N86-15932
Using digital simulation in the design of CAMAC systems N86-15934
Problems of devloping algorithmic design system N86-15939
An interactive discrete controls analysis option (ORACLS) for the CONTROLS analysis package on the IBM 3033 [AD-A158754] N86-15956
A preliminary report on some recent results in born inversion [AD-A158926] N86-15958
An implementation in Pascal: Translation of Prolog into Pascal [AD-A159552] N86-15965
Application and implementation of transient algorithms in computer programs [DE85-015396] N86-15968
Algorithms and software for pole assignment and observers, revision 1 [DE85-016068] N86-15970
Data flow graph optimization in IF1 [DE85-007979] N86-15975
Distributed FIFO allocation of identical resources using small shared space [AD-A159151] N86-15978
A new enumeration scheme for the knapsack problem [INPE-3563-PRE/769] N86-15983
An exact algorithm for the knapsack problem [INPE-3645-PRE/815] N86-15984
Constructing a perfect matching is in Random NC [AD-A157813] N86-15988
A target tracker using a Doppler compensated correlation technique [AD-A158087] N86-15990
Shift-variant multidimensional systems [AD-A158973] N86-15998
Rapidly convergent algorithms for nonsmooth optimization [AD-A159168] N86-16005
On determining the predictor of Non-Full-Rank multivariate stationary random processes [AD-A159165] N86-16024
The equal flow problem [AD-A159594] N86-16028
Ultrasonic transit time measurements using fast analog to digital conversion and a fast fourier transform based algorithm [AD-A159426] N86-16049
Ultrasonic characterization of porosity using the Kramers-Kronig relations [DE85-017346] N86-16051
An algorithm for active adaptive control of periodic interference [AD-A156651] N86-16052
Probabilistic analysis of a network resource allocation algorithm. Revision [AD-A158970] N86-16150

ALIGNMENT
Interface alignment system [AD-D011896] N86-16087

ALKENES
The catalytic activity and selectivity of chemical treated clinoptilolite in the conversion of methanol N86-15424

ALLOCATIONS
On the assignment algorithm by means of multi-linked data structure N86-15426
National Aeronautics and Space Administration authorization for fiscal year 1986 [S-HRG-99-102] N86-16163

ALTIMETERS
Dynamic characteristics of air data sensor systems: Altimeter, speedometer and alpha times beta vane [NAL-TR-852] N86-15312

ALTITUDE SIMULATION
Some effects of alcohol and simulated altitude on complex performance scores and breathanalyzer readings [AD-A158925] N86-15905

ALUMINUM
Metallographic preparation of particulate filled aluminum metal matrix composite material [AD-D011862] N86-15352
X-ray elastic constants and their meaning for Al and Fe [AD-A158251] N86-15382
Test for a possible melting transition in grain boundaries in aluminum near the melting point [DE85-013238] N86-15387
Multi-color X-ray line source [AD-D011910] N86-16088
Structural examination of iridium-based single-crystal preparations [DE85-017550] N86-16136
Heterogeneous response of aluminum and lithium niobate to shock waves [DE85-013963] N86-16140

ALUMINUM ALLOYS
Effects of chemistry and processing on the fracture related properties of P/M alloy CT91 [AD-A159299] N86-15383

ALUMINUM GALLIUM ARSENIDES
Investigation of quantum effects in heterostructures [AD-A158327] N86-15550
Influence of embedded electrical fields on temperature stability of parameters of I-Ga-As heterophotoelements N86-15615

ALUMINUM OXIDES
Beta alumina: A solid-electrolyte as a solid-state laser host [AD-A159409] N86-15684
Preparation and properties of transition metal beta aluminas [AD-A159408] N86-16130

AMINO ACIDS
Investigation of some aspects of human amino acid metabolism during 120-day antiorthostatic hypokinesia N86-15873
Formation of volatile substances during polymer destruction by Pseudomonas aeruginosa N86-15884

AMORPHOUS MATERIALS
Radiation effects in actinide host phases [DE85-016273] N86-16075

AMPLIFIERS
Analysis and identification of inertial devices N86-15594
Power combinations microwave amplifier loading characteristics N86-15610

AMPLITUDE MODULATION
Nonsinusoidal modes of oscillator with multifrequency surface-acoustic-wave resonator N86-15488

AMPLITUDES
Efficiency of coherent reception of optical signal propagating through turbulent atmosphere N86-15472
Efficiency of amplitude suppression on sinusoidal interference N86-15585

ANALOG SIMULATION
Triple pendulum for the demonstration of nonlinear coupling N86-16033

ANALOG TO DIGITAL CONVERTERS
Bipolar digitizer having compression capability [AD-D011895] N86-15542
Design of differential circuit for LSI N-threshold comparator N86-15583
Wide-band single-board analog-digital converter N86-15935
DAASY (data acquisition and analysis system) [DE85-016341] N86-15971
Ultrasonic transit time measurements using fast analog to digital conversion and a fast fourier transform based algorithm [AD-A159426] N86-16049

ANALYSIS (MATHEMATICS)
An experimental study of an ultra-mobile vehicle for off-road transportation. Appendix 2. Dissertation. Kinematic optimal design of a six-legged walking machine [AD-A159147] N86-15434
Analysis of dislocation kinetics across shocks [DE85-016444] N86-15638
Sieves and a filter for Gaussian processes [AD-A158762] N86-15994

ANALYSIS OF VARIANCE
Inadmissibility of the best equivariant estimators of the variance-covariance matrix and the generalized variance under entropy loss [AD-A159059] N86-16020

ANALYZERS
Crystal analyser mirror type down-scattering spectrometer using spallation neutron source N86-15425
Investigation of hologram analyzer with single-component optical hologram matching system N86-15507

ANGLE OF ATTACK
Hypersonic characteristics of an advanced aerospace plane at Mach 20.3 [NASA-TM-86435] N86-15245
Use of hinged strakes for lateral control at high angles of attack [AD-A158005] N86-15321

Research into heat transfer by convection in the chamber of a furnace with relation to the angle at which a high velocity jet strikes a plane surface
[BLLD-M-36478-(5828.4)] N86-15624
Numerical simulation of viscous supersonic flow over a generic fighter configuration
[NASA-TM-86623] N86-15627

ANGLES (GEOMETRY)
Time-resolved flowfield measurements in a turbine stage
[AD-A158092] N86-15634
On the angle for stationary random fields
[AD-A158982] N86-16018
GGLP effect from 1959 to 1984
[DE85-011981] N86-16069

ANHYDRIDES
Chemiluminescence from organic reactions. Formation of diphenoyl peroxide as an intermediate
[AD-A159144] N86-15341

ANISOTROPIC MEDIA
Bulletin of the Faculty of Engineering, Hokkaido University, no. 126
[ISSN-0385-602X] N86-15420
Deformation behavior of anisotropic sand during principal stress axes rotation N86-15421
Radiation pattern and reduced gain of linear antenna in turbulent anisotropic atmosphere N86-15464

ANISOTROPIC PLATES
Stress concentration around a small circular hole in the HiMAT composite plate
[NASA-TM-86038] N86-15350

ANISOTROPY
Scattering by cylinder with anisotropic impedance N86-15456
Properties of the internal wave field on the equator N86-15839

ANNUAL VARIATIONS
A numerical modelling of the seasonal variation of the tropical Pacific sea surface temperature N86-15699
Climatological data of stations in the Netherlands. No. 24: A climatology of Amsterdam airport for the period 1951 - 1980
[KNMI-150-24] N86-15837
Temporal and spatial distributions of Arctic Sea ice thickness and pressure ridging statistics
[AD-A159577] N86-15849

ANODES
Multi-color X-ray line source
[AD-D011910] N86-16088
Experiments on cryogenic pulsed ion sources N86-16098
Magnetic insulation in an ion diode with toroidal magnetic field N86-16099

ANODIC COATINGS
Characteristics of electrophysical and photoelectric properties of MOS-structures on indium arsenide N86-15486
Selective anodic oxidation of semiconductors for pattern generation
[AD-D011689] N86-16133

ANTENNA ARRAYS
Matrix analysis of periodic interleaved multifrequency antenna arrays N86-15457
Analysis of multimode waveguide-type power distributor N86-15458
Excitation of array of plane-parallel waveguides covered with dielectric layer of finite length N86-15459
Use of active quenching for reduction of power dissipation in dipole antenna array N86-15460
Signal and interference levels in antenna array with optimum radiation pattern N86-15461
Effect of corner reflector on field of linear radiator N86-15462
Longitudinally slotted cylindrical shield with finite thickness and electrical conductance N86-15463
Modular floating decimal point operations for antenna array adaptation N86-15568
Effect of cylindrical reradiator on parameters of antenna and antenna array N86-15574

ANTENNA COMPONENTS
Signal and interference levels in antenna array with optimum radiation pattern N86-15461

ANTENNA DESIGN
Effect of corner reflector on field of linear radiator N86-15462
Absolute measurements of antenna parameters by illumination method N86-15511
The design of a Rotman lens
[FEL-1985-13] N86-15537
Determination of point source image field structure by real radiooptical antenna N86-15564
Effect of cylindrical reradiator on parameters of antenna and antenna array N86-15574

ANTENNA FEEDS
Investigations and comparisons of new types of millimetre-wave planar arrays using microstrip and dielectric structures
[AD-A158313] N86-15522

ANTENNA RADIATION PATTERNS
Millimetric-wave antennas and devices: Review N86-15453
Synthesis of log-periodic antennas with prescribed geometry N86-15454
Boundary waves in finite antenna arrays N86-15455
Matrix analysis of periodic interleaved multifrequency antenna arrays N86-15457
Excitation of array of plane-parallel waveguides covered with dielectric layer of finite length N86-15459
Signal and interference levels in antenna array with optimum radiation pattern N86-15461
Effect of corner reflector on field of linear radiator N86-15462
Radiation pattern and reduced gain of linear antenna in turbulent anisotropic atmosphere N86-15464
Exact image method for impedance computation of antennas above the ground
[REPT-S-161] N86-15535
Maximum antenna power reception in lossy medium N86-15563
Effect of cylindrical reradiator on parameters of antenna and antenna array N86-15574

ANTENNAS
Boundary waves in finite antenna arrays N86-15455
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-011] N86-15484
Experiments in long-wavelength communication using modulated electron beam antennas: A parameter study
[AD-A157810] N86-15519
Effect of antenna impedance mismatch on the signal-to-noise ratio of a radio receiving system
[AD-A159070] N86-15525
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-005] N86-15561
Maximum antenna power reception in lossy medium N86-15563
Determination of point source image field structure by real radiooptical antenna N86-15564

ANTIBODIES
Ultrasensitive detection of chemical substances
[AD-A158224] N86-15363
West Europe report: Science and technology
[JPRS-WST-85-015] N86-15443

ANTIFERROMAGNETISM
Spin dynamics of a Cu-Mn spin glass alloy
[DE85-016295] N86-16134

ANTIMISTING FUELS
Antimisting kerosene: Development of a continuous 10 GPM in-line blender
[NASA-CR-176432] N86-15412

ANTIPARTICLES
Search for the Xi(2220) at Lear
[DE85-014329] N86-16070

ANTIPROTONS
Pulsed septum magnet for the Fermilab antiproton source
[DE85-016993] N86-16078
Power combiners/dividers for loop pickup and kicker arrays FNAL stochastic cooling rings
[DE85-016562] N86-16121

ANXIETY
Effect of threat stress on psychomotor stability of pilots differing in anxiety level N86-15869

APPROPRIATIONS
National Science Foundation authorization, 1986
[GPO-46-945] N86-16162
National Aeronautics and Space Administration authorization for fiscal year 1986
[S-HRG-99-102] N86-16163

APPROXIMATION
Numerical solutions for three-dimensional cases: Delta wings N86-15264
Non-uniform bounds of normal approximation for finite-population U-statistics
[AD-A159163] N86-16003
Tests for a change-point
[AD-A159361] N86-16025

AQUATIC PLANTS
A comparison of LANDSAT TM to MSS imagery for detecting submerged aquatic vegetation in lower Chesapeake Bay N86-15707
Remote reconnaissance of submerged aquatic vegetation: A radiative transfer approach N86-15708

AQUIFERS
Monitoring of hot water plume movements in an aquifer with borehole/surface resistivity measurements
[DE85-014531] N86-15637

ARCHITECTURE (COMPUTERS)
Interactive information processing for NASA's mesoscale analysis and space sensor program N86-15817
Organization of processor oriented to multiprocessing N86-15931
Modeling problem-oriented multiprocessor systems N86-15932
Relational programming: Design and implementation of a prototype interpreter
[AD-A159404] N86-15962
ANL/Star Project: A new architecture for large scale theoretical physics computations
[DE85-014988] N86-16144
Queueing network systems with unbalanced flows and their applications to performance evaluation of highly parallel distributed information systems: Revision
[AD-A158052] N86-16154

ARCTIC REGIONS
Temporal and spatial distributions of Arctic Sea ice thickness and pressure ridging statistics
[AD-A159577] N86-15849

ARID LANDS
Biochemical processes in sagebrush ecosystems: Interactions with terrain
[E86-10015] N86-15705

ARITHMETIC
The revised report on Scheme or an uncommon Lisp
[AD-A159423] N86-15963

ARMED FORCES (UNITED STATES)
United States Air Force Academy, Department of Chemistry Research: AY 1983-1984
[AD-A159319] N86-15343
Comparison of the Air Force female and male pilot grounded time in the Air Force Military Airlift Command
[AD-A158093] N86-15902

ARRAYS
Boundary waves in finite antenna arrays N86-15455
Research in adaptive beamforming for satellite communications
[AD-A157626] N86-15520
Self-guarding Schottky barrier infrared detector array
[AD-D011894] N86-15541
A two-terminal microelectrochemical diode with contact spacing of about one micron. A device based on one solution redox couple and one electrode-confined redox couple
[AD-A158774] N86-15553
Micron-spaced platinum interdigitated array electrode: Fabrication, theory and initial use
[AD-A159429] N86-15556
Heat transfer characteristics within an array of impinging jets. Effects of crossflow temperature ...iative to jet temperature
[NASA-CR-3936] N86-15625
Wavelength error analysis in a multiple-beam Fizeau laser wavemeter having a linear diode array readout
[NASA-TM-87614] N86-16089

ARTIFICIAL GRAVITY
Basic results of experiments with long-term rotation of rats as applied to the problem of artificial gravity N86-15878

ARTIFICIAL INTELLIGENCE
A research program in computer technology
[AD-A157991] N86-15920
Microelectronics technology N86-15930
Possibility of artificial intelligence in computers N86-15944
Belorussian computer speaks, reads graphics, X-rays N86-15945
KBEmacs (Knowledge-Based Editor in emacs): A step toward the programmer's apprentice
[AD-A157814] N86-15948
Expert systems in engineering practice
[ISBN-90-6818-018-5] N86-15977
Hypercube concurrent computation and virtual time for robotic application
[DE85-009479] N86-15979

ARTIFICIAL SATELLITES
West Europe report: Science and technology
[JPRS-WST-85-024] N86-15447
Launchers, satellites, multinational plans in 1985 CHES budget N86-15448

ARTILLERY
Human factors engineering design criteria for future systems. Report number 3: Design criteria evolving from the Multiple Multiple Rocket System (MLRS) operational test 3
[AD-A158316] N86-15916

ASBESTOS
Investigation of the friction of Becorit 820 versus cast iron
[WB-83/TRI-10053] N86-15675

ASPECT RATIO
Large aspect ratio, high-beta tokamak fusion reactor
[DE85-016654] N86-16122

ASPHERICITY
Generation of electromagnetic radiation in radio-frequency band in solids exposed to laser radiation N86-15509
ASSAYING
Demonstration of the in-field use of calorimetric assay for IAEA inspection purposes
[DE85-016448] N86-16083
ASSEMBLER ROUTINES
Functional-logical system for automated planning of robot production line control systems N86-15940
ASSURANCE
Assurance Program for Remedial Action (APRA) microcomputer-operated bibliography management system
[DE85-008763] N86-16155
ASTROPHYSICS
Black holes, pregalactic stars and the dark matter problem
[DE85-015385] N86-16168
Possibilities at LAMPF for studying nuclei of astrophysical interest
[DE85-017526] N86-16173
ATLANTIC OCEAN
Observations of equatorially trapped waves in the eastern Atlantic Ocean from inverted echo sounders N86-15840
Dynamics and structure of Gulf Stream meanders northeast of Cape Hatteras, N.C. N86-15841
The CTD data from the Northeast Atlantic 22 N-33 N, 19 W-24 W, July 1983. Discovery cruises 138, 139. --- conductivity, temperature, depth (CTD)
[IOS-188] N86-15850
CTD data from the Northeast Atlantic Ocean 40-48 N, 12-21 W collected on RRS DISCOVERY cruise 132 in February 1983 --- conductivity, temperature, depth (CTD)
[IOS-192] N86-15851
The IOS geophysical data held on magnetic tape - summary. Bathymetric, magnetic and gravity data collected during marine geology and geophysics cruises 1973 - 1984
[IOS-194] N86-15852
An operational wave model for the North Atlantic Ocean
[KNMI-WR-85-3] N86-15857
ATMOSPHERIC ATTENUATION
Procedure for calculating attenuation in and reliability of atmospheric optical data transmission systems N86-15470
ATMOSPHERIC BOUNDARY LAYER
Single station assessment of atmospheric boundary layer properties in the eastern Mediterranean Sea
[AD-A159432] N86-15827
ATMOSPHERIC CHEMISTRY
Micro-Raman spectroscopy: The analysis of micrometer and submicrometer atmospheric aerosols
[NASA-CR-177964] N86-15756
ATMOSPHERIC CIRCULATION
Large-scale circulation anomalies and the predictability of northeast Brazil droughts
[INPE-3656-PRE/819] N86-15768
NASA/MSFC FY-85 Atmospheric Processes Research Review
[NASA-CP-2402] N86-15769
Theoretical and experimental studies of baroclinic processes N86-15770
Theoretical and experimental studies in support of the Geophysical Fluid Flow Experiment N86-15772
Theoretical and experimental design studies for the Atmospheric General Circulation Experiment N86-15773
Dynamics and energetics of the South Pacific Convergence Zone during FGGE SOP-1 N86-15779
Validation of outgoing longwave radiation in the GLAS (Goddard Laboratory for Atmospheric Sciences) general circulation model
[AD-A158006] N86-15823
ATMOSPHERIC COMPOSITION
The CO2 and CO abundances below 130 km altitude from infrared spectra
[AERONOMICA-ACTA-A-296-1985] N86-15753
ATMOSPHERIC ELECTRICITY
Geophysical Bulletin of Hokkaido University, no. 46
[ISSN-0439-3503] N86-15695
Observations on the atmospheric electrical environment of sea fog in the Pacific Coast of Eastern Hokkaido, Japan N86-15697
NASA/MSFC FY-85 Atmospheric Processes Research Review
[NASA-CP-2402] N86-15769
Application of satellite data to tropic/subtropic moisture coupling N86-15780
Severe storm electricity N86-15783
Storm severity detection (RF) N86-15784
Airborne atmospheric electricity experiments N86-15790
ATMOSPHERIC GENERAL CIRCULATION EXPERIMENT
Theoretical and experimental design studies for the Atmospheric General Circulation Experiment N86-15773
ATMOSPHERIC MODELS
Transverse motion of high speed barium clouds in the ionosphere
[AD-A159058] N86-15760
Variation objective analyses for cyclone studies N86-15777
Observational and theoretical studies of the evolving structure of baroclinic waves: Attractor dynamics of global weather systems N86-15781
Mesoscale research activities with the LAMPS model N86-15803
Atmospheric Modeling And Sensor Simulation (AMASS) study N86-15815
Validation of outgoing longwave radiation in the GLAS (Goddard Laboratory for Atmospheric Sciences) general circulation model
[AD-A158006] N86-15823
A conceptual model of the severe-storm environment for inclusion into Air Weather Service severe-storm analysis and forecast procedures
[AD-A158010] N86-15824
The Earth's atmosphere: Ideas old and new
[AD-A159558] N86-15826
ATMOSPHERIC MOISTURE
Temperature and humidity data for design: British forces area of West Germany
[MET-O-MEMO-113] N86-15767
ATMOSPHERIC PHYSICS
Activities report in meteorology
[AR-83/84] N86-15836
ATMOSPHERIC PRESSURE
A conceptual model of the severe-storm environment for inclusion into Air Weather Service severe-storm analysis and forecast procedures
[AD-A158010] N86-15824
ATMOSPHERIC SOUNDING
Mobile intercept of storms N86-15771
Variation objective analyses for cyclone studies N86-15777
Statistical analysis and use of VAS radiance data N86-15811
Improved satellite retrievals and mesoscale moisture variability N86-15812
Doppler wind profile experiment N86-15818
ATMOSPHERIC TEMPERATURE
The reduction of nocturnal cooling value by smudging N86-15696
Temperature and humidity data for design: British forces area of West Germany
[MET-O-MEMO-113] N86-15767
ATMOSPHERIC TURBULENCE
Radiation pattern and reduced gain of linear antenna in turbulent anisotropic atmosphere N86-15464
Efficiency of coherent reception of optical signal propagating through turbulent atmosphere N86-15472
Effectiveness of phase-conjugation systems in turbulent atmosphere N86-15513
ATMOSPHERICS
Systematic and random variations in digital Thematic Mapper data
[E86-10018] N86-15711
ATOM CONCENTRATION
Statistical model for the trapping of interstitials by substitutional (interstitial) atoms in solids
[PREPRINT-442] N86-16141
ATOMIC BEAMS
Material shields against neutral atomic particle beams
[AD-A159445] N86-16058
ATOMIC SPECTRA
Auroral thermosphere temperatures from observations of 6300 A emissions
[NASA-TM-86530] N86-15755
ATOMIC STRUCTURE
Self-consistent electronic structure of alpha-phase Hume-Rothery electron compound
[DE85-017560] N86-16080
Electronic structure of rare Earth metals and intermetallics
[DE85-015523] N86-16139
ATOMIC WEIGHTS
Tables of masses, binding energies, half-lives and natural abundances
[DE85-016344] N86-16061
ATOMS
Precessions of the Earth and the Bohr atom
[DE85-015612] N86-16171
ATTENUATION
Ultrasonic characterization of porosity using the Kramers-Kronig relations
[DE85-017346] N86-16081
ATTITUDE (INCLINATION)
Investigation of factors determining pilot's geocentric orientation N86-15868
ATTITUDE CONTROL
Advanced Integrated Power and Attitude Control System (IPACS) study
[NASA-CR-3912] N86-15338
AUDIO FREQUENCIES
A theoretical investigation of acoustic cavitation
[AD-A158058] N86-16042
AUDITORY SIGNALS
A computer model of peripheral auditory processing
[NPL-DITC-58/85] N86-16037
AURORAL IONIZATION
Lower hybrid parametric processes on auroral field lines in the topside ionosphere
[UIO-SR-85-03] N86-15764
AURORAL TEMPERATURE
Auroral thermosphere temperatures from observations of 6300 A emissions
[NASA-TM-86530] N86-15755
AUTOCORRELATION
A target tracker using a Doppler compensated correlation technique
[AD-A158087] N86-15990
AUTOMATIC CONTROL
Light helicopter family trade-off analysis. Volume 7: Appendix R
[AD-A158076] N86-15307
West Europe report: Science and technology
[JPRS-WST-85-026] N86-15435
Active magnetic suspension in main magnetic field of electric motor N86-15502
An examination of some error correcting techniques for continuous speech recognition technology
[AD-A158001] N86-15521
West Europe report: Science and technology
[JPRS-WST-85-027] N86-15678
Flat to assemble efficient engine in automated plant N86-15679
Automated mesoscale winds derived from GOES multispectral imagery N86-15798
USSR report: Cybernetics, computers and automation technology
[JPRS-UCC-85-004] N86-15927
Microelectronics technology N86-15930
Functional-logical system for automated planning of robot production line control systems N86-15940
Automated flaw detection information-measuring system N86-15941
USSR report: Cybernetics, computers and automation technology
[JPRS-UCC-85-009] N86-15943
Work on putting computer and CRTs in airliner control panels N86-15947
Computer-assisted program design
[DE85-015315] N86-15973
AUTOMATIC PILOTS
PIFCGT: A PIF autopilot design program for general aviation aircraft
[NASA-CR-166123] N86-15320
AUTOMATIC TEST EQUIPMENT
Analysis of automated light guide pulse dispersion measurement N86-15805
Automatic calibration of the temperature channel on Banderas recording current meters --- ocean currents
[IOS-206] N86-15856
AUTOMOBILE ENGINES
Review of the development of small- and medium-capacity gas turbines at the Motoren- und Turbinen Union
[NASA-TM-77942] N86-15314
Creep rupture behavior of Stirling engine materials
[NASA-TM-87209] N86-15380
Flat to assemble efficient engine in automated plant N86-15679
Ceramic automotive Stirling engine study
[NASA-CR-174907] N86-16165
AUTOMOBILES
West Europe report: Science and technology
[JPRS-WST-85-027] N86-15678
AUTONOMY
Equilibrium positions and equilibrium domains of autonomous systems
[RUB-IFM-MITT-45] N86-15982
AUTOREGRESSIVE PROCESSES
Degenerate multivariate stationary processes: Basicity, past and future, and autoregressive representation
[AD-A158979] N86-16015
AUXILIARY POWER SOURCES
Small turbine technology review
[AD-A158514] N86-15316
AVALANCHE DIODES
External locking of IMPATT-diode power oscillators N86-15618

AVIONICS
A fault tolerant system for an integrated avionics sensor configuration
[NASA-CR-3834] N86-15278
AXES OF ROTATION
Deformation behavior of anisotropic sand during principal stress axes rotation N86-15421
AXIAL FLOW
Analysis of the effects of transient heat transfer on axial flow compressor blade boundary layers
[AD-A158094] N86-15315

B

BACILLUS
On the effects of X irradiation on the Bacillus subtilis spores in a day and wet system
[DFVLR-FB-85-44] N86-15864
BACKGROUND NOISE
Number of targets threatened simultaneously (NOTTS) in conjunction with over the horizon back-scatter (OTHB) radar coverage
[AD-A159304] N86-15528
BACKSCATTERING
Investigations of the interference scattering and methods for its suppression in near-ground radar backscattering measurements
[DFVLR-FB-85-42] N86-15539
Analysis of Doppler lidar data N86-15792
BACTERIA
Determination of increment of Bacillus subtilis biomass in weightlessness N86-15881
BALLOON-BORNE INSTRUMENTS
A proposed technique for the Venus balloon telemetry and Doppler frequency recovery
[NASA-CR-176448] N86-15333
Measurements of statospheric ozone by indigo decoloration N86-15763
BANACH SPACE
Control of nonlinear distributed parameter systems
[INPE-3624-PRE/808] N86-15987
BANDWIDTH
Digital television routing systems: An introduction to integrated optical waveguide techniques and devices
[BBC-RD-1985/9] N86-15515
A brief investigation of adaptive decision feedback equalization for digital HF links employing PSK (Phase Shift Keying) modulation
[AD-A157809] N86-15545
Lightning mapper and the future N86-15786
BAROCLINIC INSTABILITY
NASA/MSFC FY-85 Atmospheric Processes Research Review
[NASA-CP-2402] N86-15769
Theoretical and experimental studies of baroclinic processes N86-15770
Theoretical and experimental design studies for the Atmospheric General Circulation Experiment N86-15773
The use of satellite data in understanding and predicting convective and large-scale dynamical processes N86-15776
Dynamics and energetics of the South Pacific Convergence Zone during FGGE SOP-1 N86-15779
BAROCLINIC WAVES
NASA/MSFC FY-85 Atmospheric Processes Research Review
[NASA-CP-2402] N86-15769
Theoretical and experimental studies of baroclinic processes N86-15770
Theoretical and experimental design studies for the Atmospheric General Circulation Experiment N86-15773
Observational and theoretical studies of the evolving structure of baroclinic waves: Attractor dynamics of global weather systems N86-15781
BAROCLINITY
Mesoscale ageostrophic circulations associated with baroclinic jet streaks N86-15795
BAROTRAUMA
Some aspects of determining human physical work capacity under hyperbaric conditions N86-15867
BAROTROPIC FLOW
The use of satellite data in understanding and predicting convective and large-scale dynamical processes N86-15776
BATHYMETERS
Description, analysis, and prediction of sea-floor roughness using spectral models
[AD-A158000] N86-15846
The IOS geophysical data held on magnetic tape - summary. Bathymetric, magnetic and gravity data collected during marine geology and geophysics cruises 1973 - 1984
[IOS-194] N86-15852
BEACHES
Wave and surf forecast model evaluation for use on a micro computer
[AD-A159063] N86-15848
BEAM CURRENTS
Summary from Working Group on Multiple Beams and Funneling
[DE85-015694] N86-16065
IFA-2 collective ion accelerator experiments
[DE85-012358] N86-16067
Experiments on cryogenic pulsed ion sources N86-16098
BEAM INJECTION
Novel transport and recombination processes in semiconductors
[AD-A158321] N86-15549
Measuring the orbit length of the Tevatron
[DE85-017443] N86-16079
Numerical analysis for current neutralization of rotating light ion beam N86-16108
BEAM INTERACTIONS
Summary from Working Group on Multiple Beams and Funneling
[DE85-015694] N86-16065
BEAM NEUTRALIZATION
Numerical analysis for current neutralization of rotating light ion beam N86-16108
BEAM SPLITTERS
Interface alignment system
[AD-D011896] N86-16087
BEAMS (RADIATION)
Textured carbon on copper: A novel surface with extremely low secondary electron emission characteristics
[NASA-TP-2543] N86-15394
Interface alignment system
[AD-D011896] N86-16087
Large memory acousto-optically addressed pattern recognition
[AD-D011861] N86-16092
Power combiners/dividers for loop pickup and kicker arrays FNAL stochastic cooling rings
[DE85-016562] N86-16121
Selective anodic oxidation of semiconductors for pattern generation
[AD-D011889] N86-16133
BEAMS (SUPPORTS)
Spring stiffnesses for beam-column analysis of soil-structure interaction problems
[AD-A158072] N86-15690
BEARINGLESS ROTORS
Parametric study of the aeroelastic stability of a bearingless rotor N86-15283
Experimentally determined flutter from two- and three-bladed model bearingless rotors in hover N86-15286
BEARINGS
Elastic bearing
[AD-A159140] N86-15672
Static and dynamic material model for elastohydrodynamic bearing calculations
[IWECO-5076503] N86-15676
BEAUFORT SEA (NORTH AMERICA)
Arctic Ocean background noise caused by ridging of sea ice
[AD-A159587] N86-16050
BENZOIC ACID
Chemiluminescence from organic reactions. Formation of diphenoyl peroxide as an intermediate
[AD-A159144] N86-15341
BETA FACTOR
Large aspect ratio, high-beta tokamak fusion reactor
[DE85-016654] N86-16122
Superconducting resonators for the University of Washington booster linac
[DE85-017419] N86-16124
BETA PARTICLES
Beta alumina: A solid-electrolyte as a solid-state laser host
[AD-A159409] N86-15664
BETATRONS
Research on intense electron beams and applications
[AD-A158234] N86-16055
BIBLIOGRAPHIES
Research in applied mathematics related to nonlinear system theory
[AD-A158330] N86-16027
NASA patent abstracts bibliography: A continuing bibliography. Section 1: Abstracts (supplement 26)
[NASA-SP-7039(26)-SECT-1] N86-16151
SABIRS: User reference and system documentation
[DE85-016801] N86-16157
BICRYSTALS
Test for a possible melting transition in grain boundaries in aluminum near the melting point
[DE85-013238] N86-15387
BINARY DATA
Lower limit of error probability in discrete addition of binary signals from parallel channels N86-15586
BINDING
Thermal-mechanical fatigue test apparatus for metal matrix composites and joint attachments
[NASA-TM-87187] N86-15378
BINOCULAR VISION
Binocular image flows: Steps toward stereo - motion fusion
[AD-A158089] N86-15901
BIOCHEMICAL OXYGEN DEMAND
Oxygenation and regional circulation in gingival mucosal tissues under effect of head-to-pelvis (+Gz) accelerations N86-15872
BIOCHEMISTRY
United States Air Force Academy, Department of Chemistry Research: AY 1983-1984
[AD-A159319] N86-15343
Ultrasensitive detection of chemical substances
[AD-A158224] N86-15363
Electron reactions in model and biological systems
[DE85-016062] N86-15861
USSR report: Space Biology and Aerospace Medicine, volume 19, no. 4, July - August 1985
[JPRS-USB-85-006] N86-15865
BIODEGRADATION
Formation of volatile substances during polymer destruction by Pseudomonas aeruginosa N86-15884
BIODYNAMICS
Statistical research on problems of biodynamics
[AD-A157993] N86-15899
BIOGEOCHEMISTRY
Biochemical processes in sagebrush ecosystems: Interactions with terrain
[E86-10015] N86-15705
BIOINSTRUMENTATION
Optimum frequency of communication channel for indoor radio telemetry N86-15493
BIOLOGICAL EFFECTS
A review of biological processes within oceanic water columns relevant to the assessment of the safety of disposal of waste, notably radioactive isotopes, on or within the seabed
[IOS-198] N86-15745
Freezing of living cells
[DE85-016297] N86-15862
On the effects of X irradiation on the Bacillus subtilis spores in a day and wet system
[DFVLR-FB-85-44] N86-15864
Basic results of experiments with long-term rotation of rats as applied to the problem of artificial gravity N86-15878
Investigation of mineral nutrition of a new form of microalgae to be used in biological life-support systems N86-15892
BIOLOGICAL MODELS (MATHEMATICS)
Computational models of human vision with applications
[NASA-CR-176413] N86-15898
BIOMASS
Remote sensing of coastal wetlands biomass using Thematic Mapper wavebands N86-15709
Determination of increment of Bacillus subtilis biomass in weightlessness N86-15881
Investigation of mineral nutrition of a new form of microalgae to be used in biological life-support systems N86-15892
BIOTECHNOLOGY
West Europe report: Science and technology
[JPRS-WST-85-028] N86-15435
West Europe report: Science and technology
[JPRS-WST-85-015] N86-15443
West Europe report: Science and technology
[JPRS-WST-85-024] N86-15447
Biotechnology and agriculture
[GPO-48-672] N86-15712
National Science Foundation authorization, 1986
[GPO-46-945] N86-16162
BIPOLAR TRANSISTORS
Fuji, Thomson to develop, produce high-powered transistors N86-15437
Micro-power dissipation device described N86-15441
High-frequency characteristics of ballistic bipolar heterojunction transistors N86-15616
BIPOLARITY
Bipolar digitizer having compression capability
[AD-D011895] N86-15542
BIRTH
Can aircraft noise less than or equal 115 to dBA adversely affect reproductive outcome in USAF women?
[AD-A158322] N86-16045

BISTABLE CIRCUITS
Effect of optical injection on the optical properties of a (GaAl)As semiconductor laser: Optical bistability and four wave mixing
[ENST-85E005] N86-15667
BLACK HOLES (ASTRONOMY)
Black holes, pregalactic stars and the dark matter problem
[DE85-015385] N86-16168
Theoretical models for Type 1 and Type 2 supernova
[DE85-016288] N86-16174
BLADE TIPS
Aeroelastic considerations for torsionally soft rotors N86-15289
BLOOD
Informativeness of echo signal in pulsed ultrasonography of the brain (with use of model) N86-15887
BLOOD CIRCULATION
Oxygenation and regional circulation in gingival mucosal tissues under effect of head-to-pelvis (+Gz) accelerations N86-15872
BLOOD PLASMA
Investigation of some aspects of human amino acid metabolism during 120-day antiorthostatic hypokinesia N86-15873
BLOOD PRESSURE
Oxygenation and regional circulation in gingival mucosal tissues under effect of head-to-pelvis (+Gz) accelerations N86-15872
BLURRING
Pseudoinverse restoration of blurred image in uniform motion N86-15483
BODY FLUIDS
Investigation of possibility of using two-frequency impedometry for estimation of proportion of total and extracellular body fluids N86-15888
BODY TEMPERATURE
Human thermoregulatory responses to cold air are altered by repeated cold water immersion
[AD-A158871] N86-15904
BOHR THEORY
Precessions of the Earth and the Bohr atom
[DE85-015612] N86-16171
BOLOMETERS
Thin-film bolometer power transduce electrodynamic analysis and experimental investigation N86-15609
BOMBER AIRCRAFT
Number of targets threatened simultaneously (NOTTS) in conjunction with over the horizon back-scatter (OTHB) radar coverage
[AD-A159304] N86-15528
BOMBS (ORDNANCE)
A buffer diverter system
[AD-D011902] N86-15559
BONE MARROW
Effect of 24,25-dihydroxyvitamin D3 on osteogenetic precursor cells in immobilized rats N86-15877
BOREHOLES
Effects of load proportioning on the capacity of multiple-hole composite joints
[NASA-CR-178019] N86-15687
One-dimensional iterative inversion of vertical seismic profiles N86-15748
BOROSILICATE GLASS
Micron-spaced platinum interdigitated array electrode: Fabrication, theory and initial use
[AD-A159429] N86-15556
BOUGUER LAW
Procedure for calculating attenuation in and reliability of atmospheric optical data transmission systems N86-15470
BOUNDARIES
The movement of a cluster of particles subject to the effect of gravity and their sedimentation onto a plane horizontal surface
[BLL-RISLEY-TR-5161-(9091.9F)] N86-15623
BOUNDARY LAYER COMBUSTION
Multi-dimensional combustion instability analysis of solid propellant rocket motors
[AD-A158314] N86-15414
BOUNDARY LAYER CONTROL
Aircraft Drag Prediction and Reduction
[AGARD-R-723] N86-15266
Aircraft drag reduction technology: A summary N86-15267
Laminar flow control with suction: Theory and experiment N86-15269
Design considerations for application of laminar flow control systems to transport aircraft N86-15270
Turbulent drag reduction for external flows N86-15271
Transonic drag rise and drag reduction by active/passive boundary layer control N86-15275
BOUNDARY LAYER FLOW
Prediction of the drag of wings at subsonic speeds by viscous/inviscid interaction techniques N86-15274
Taylor-Goertler instabilities of Tollmien-Schlichting waves and other flows governed by the interactive boundary layer equations
[NASA-CR-178010] N86-15628
Hydrodynamic noise and surface compliance--an overview of the Naval Underwater Systems Center IR/IED program
[AD-A157799] N86-15630
Numerical simulation of convective response to mesoscale forcing N86-15806
BOUNDARY LAYER SEPARATION
Numerical study of the laminar shock boundary layer interaction
[DFVLR-FB-85-34] N86-15642
BOUNDARY LAYER STABILITY
Boundary-layer transition: T-S waves and crossflow mechanisms N86-15268
Laminar flow control with suction: Theory and experiment N86-15269
BOUNDARY LAYER TRANSITION
Aircraft Drag Prediction and Reduction
[AGARD-R-723] N86-15266
Boundary-layer transition: T-S waves and crossflow mechanisms N86-15268
Laminar flow control with suction: Theory and experiment N86-15269
BOUNDARY LAYERS
Relative advantages of thin-layer Navier-Stokes and interactive boundary-layer procedures
[NASA-TM-86778] N86-15244
F-111 natural laminar flow glove flight test data analysis and boundary layer stability analysis
[NASA-CR-166051] N86-15305
Analysis of the effects of transient heat transfer on axial flow compressor blade boundary layers
[AD-A158094] N86-15315
Effects of waves on the boundary layer of a surface-piercing body
[AD-A158053] N86-15633
BOUNDARY VALUE PROBLEMS
Formulation of the Euler boundary value problem N86-15258
Numerical methods N86-15259
Numerical solutions for three-dimensional cases: Swept wings N86-15263
Concluding remarks N86-15265
Boundary waves in finite antenna arrays N86-15455
Scattering by cylinder with anisotropic impedance N86-15456
Analysis of multimode waveguide-type power distributor N86-15458
Excitation of array of plane-parallel waveguides covered with dielectric layer of finite length N86-15459
Effects of waves on the boundary layer of a surface-piercing body
[AD-A158053] N86-15633
Numerical methods for singularly perturbed differential equations with applications
[AD-A158969] N86-15997
BRAGG ANGLE
Profile fitting in residual stress determination
[AD-A158881] N86-15691
BRAIN
Informativeness of echo signal in pulsed ultrasonography of the brain (with use of model) N86-15887
Possibility of artificial intelligence in computers N86-15944
BRAKES
Investigation of the friction of Becorit 820 versus cast iron
[WB-83/TRI-10053] N86-15675
BRAKES (FOR ARRESTING MOTION)
Programming a multiple-orifice hydraulic decelerator
[AD-A159428] N86-15328
BRANCHING (MATHEMATICS)
Adapter pallet system
[AD-D011858] N86-15671
BRAYTON CYCLE
Assessment of dynamic energy conversion systems for radioisotope heat sources
[DE85-016202] N86-15737
BRAZIL
Large-scale circulation anomalies and the predictability of northeast Brazil droughts
[INPE-3656-PRE/819] N86-15768
BRIGHTNESS
Operation at high voltage and power brightness of ion beam on conical pinched electron beam diode N86-16105
Solar coronal white light, Fe 10, Fe 14 and Ca 15 observations during 1984: An atlas of synoptic charts
[PB85-191013] N86-16179
BRIGHTNESS TEMPERATURE
Satellite passive microwave rain measurement techniques for land and ocean N86-15799
Severe storm identification with satellite microwave radiometry: An initial investigation with Nimbus-7 SMMR data
[NASA-CR-176431] N86-15821
Satellite microwave observations of a storm complex: A comparative analysis
[NASA-CR-176430] N86-15822
BROADBAND
Surface passivation of semiconductor circuit elements with layer of wideband semiconductor N86-15485
Broadband simulation of multipath propagation in VHF mobile radio
[MBB-UA-905/85] N86-15540
Characteristics of radar objects detectable by superwide-band signals N86-15576
Wide-band single-board analog-digital converter N86-15935
Location of noise sources using a phase-slope method
[NASA-TP-2505] N86-16041
The broadband normal mode model PROTEUS
[AD-A159091] N86-16048
Ultrasonic transit time measurements using fast analog to digital conversion and a fast fourier transform based algorithm
[AD-A159426] N86-16049
BROADBAND AMPLIFIERS
Acceptance test plan for broadband microwave amplifier panel
[AD-A159450] N86-15558
BROADCASTING
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-009] N86-15452
Main trends in satellite communication and broadcasting research N86-15494
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-006] N86-15561
BRONZES
Research on the crystal growth and dielectric properties of high permittivity ferroelectric materials
[AD-A157820] N86-16126
BROWNIAN MOVEMENTS
Stochastic integration for operator valued processes on Hilbert spaces and on nuclear spaces
[AD-A158878] N86-16014
Stochastic integrals and processes with independent increments
[AD-A158939] N86-16017
BUBBLES
A theoretical investigation of acoustic cavitation
[AD-A158058] N86-16042
BUDGETING
Launchers, satellites, multinational plans in 1985 CHES budget N86-15448
National Aeronautics and Space Administration authorization for fiscal year 1986
[S-HRG-99-102] N86-16163
BUFFERS (CHEMISTRY)
A buffer diverter system
[AD-D011902] N86-15559
BULK ACOUSTIC WAVE DEVICES
The Surface Acoustic Wave (SAW) chemisensor. Part 1: A literature review
[PML-1985-3-PT-1] N86-15649
BURNING RATE
Preliminary results of velocities and deceleration of aluminum, magnesium, zirconium, tantalum, pyrofuze and titanium particles burning in steam
[AD-A159141] N86-15365
Burning time and size of aluminum, magnesium, zirconium, tantalum, and pyrofuze particles burning in steam
[AD-A159161] N86-15366
Multi-dimensional combustion instability analysis of solid propellant rocket motors
[AD-A158314] N86-15414
BURSTS
Analysis of satellite data for sensor improvement (detection of severe storms from space) N86-15796
BUS CONDUCTORS
Multiprocessor systems with dynamic redistribution of requests through a common bus N86-15933
Using digital simulation in the design of CAMAC systems N86-15934

C

CADMIUM SELENIDES
Photoluminescent response of palladium-cadmium sulfide and palladium-graded cadmium sulfoselenide Schottky diodes to molecular hydrogen
[AD-A158759] N86-15552

CADMIUM SULFIDES
Photoluminescent response of palladium-cadmium sulfide and palladium-graded cadmium sulfoselenide Schottky diodes to molecular hydrogen
[AD-A158759] N86-15552
CALCIFEROL
Effect of 24,25-dihydroxyvitamin D3 on osteogenetic precursor cells in immobilized rats N86-15877
CALCULUS OF VARIATIONS
Adaptive grid generation using elliptic generating equations with precise coordinate controls
[AD-A159158] N86-16002
CALIBRATING
Evaluation of a load cell model for dynamic calibration of the rotor systems research aircraft N86-15304
Proving ring calibrations using a deadweight pressure system
[RFP-3677] N86-15650
Measurement of radiation intensity on the IEA SSPS/CRS solar tower plant in Spain
[DFVLR-FB-85-36] N86-15739
Automatic calibration of the temperature channel on Banderaa recording current meters — ocean currents
[IOS-206] N86-15856
CALIFORNIA
Water resources data for California, water year 1983. Volume 3: Southern Central Valley Basins and the Great Basin from Walker River to Trucker River
[PB85-232312] N86-15720
CALIFORNIUM ISOTOPES
Mean fission neutron spectrum energies for (252) Cf and fissile nuclides, (233)U, (235)U, (239)Pu and (241)Pu
[DE85-013298] N86-16086
CAMBERED WINGS
West Europe report: Science and technology
[JPRS-WST-85-024] N86-15447
MBB studies variable-camber wing for Airbus N86-15449
CAMERA SHUTTERS
Novel control circuit for proximity focused microchannel plate image intensifiers N86-15481
CAMERAS
An optimisation method for reconstruction of flight path trajectories from non-synchronous time-sampled observations by two cine cameras
[ARL-SYS-R-34] N86-15279
CAMS
Machine with an intermittently rotating table for the performance of work operations
[AD-D011911] N86-15669
CANOPIES
Numerical simulation of viscous supersonic flow over a generic fighter configuration
[NASA-TM-86823] N86-15627
Method of calculating angular dimensions of flight vehicle cockpit canopy casings N86-15886
CANOPIES (VEGETATION)
A comparison of LANDSAT TM to MSS imagery for detecting submerged aquatic vegetation in lower Chesapeake Bay N86-15707
Remote reconnaissance of submerged aquatic vegetation: A radiative transfer approach N86-15708
Remote sensing of coastal wetlands biomass using Thematic Mapper wavebands N86-15709
CAPACITANCE
Characteristics of electrophysical and photoelectric properties of MOS-structures on indium arsenide N86-15486
DLTS (Deep-Level Transient Spectroscopy) analysis of germanium and Al sub x Ga sub 1-x As solar cells
[AD-A159114] N86-15732
CAPACITANCE-VOLTAGE CHARACTERISTICS
Sensitivity of squids built with low-capacitance Josephson tunnel junctions N86-15617
CAPACITORS
Electrical characteristics of Si devices fabricated with completely consumed carbide (C3) dielectric isolation process
[AD-A158296] N86-15547
Completely consumed carbide (C3) - A new process for dielectric isolation
[AD-A158298] N86-15548
CARBON
Textured carbon on copper: A novel surface with extremely low secondary electron emission characteristics
[NASA-TP-2543] N86-15394
Improved lifetime high voltage switch electrode
[AD-A158961] N86-15554
CARBON DIOXIDE
Electrolysis of CO(2) by novel metallopolymeric cathodes
[AD-A158228] N86-15364
The CO2 and CO abundances below 130 km altitude from infrared spectra
[AERONOMICA-ACTA-A-296-1985] N86-15753
Teh carbon dioxide system and its role on trace metal chemistry in the marine environment N86-15843
Man's tolerance to fulminant form of hypoxic hypoxia N86-15879
CARBON DIOXIDE LASERS
Coupled high power waveguide laser research
[AD-A159079] N86-15662
CARBON MONOXIDE
The CO2 and CO abundances below 130 km altitude from infrared spectra
[AERONOMICA-ACTA-A-296-1985] N86-15753
CARBON STEELS
A study of reactive sputter etching for carbon steel by Freon gas: On the effect of oxygen gas mixture N86-15422
Investigation of the friction of Becorit 820 versus cast iron
[WB-83/TRI-10053] N86-15675
CARBONYL COMPOUNDS
Topical hazard evaluation program of Candidate Insect repellent AI3-35770 Hexahydro-1-((2-Methylcyclohexyl) Carbonyl)-1-H-Azepine
[AD-A158386] N86-15903
CARCINOGENS
Electron reactions in model and biological systems
[DE85-016062] N86-15861
CARDIOGRAPHY
Automatic determination of cardiac output from rheogram of the trunk N86-15889
CARDIOVASCULAR SYSTEM
Effect of level of physical activity on lipid metabolism of flight personnel N86-15871
CARGO AIRCRAFT
Adapter pallet system
[AD-D011858] N86-15671
CARTESIAN COORDINATES
Analysis of elliptical waveguides in cylindrical reference basis N86-15612
CASCADE CONTROL
Monolithic cascade-type solar cells
[NASA-TM-77926] N86-15731
CASCADE FLOW
Reference test cases and contributors N86-15261
CASING
Method of calculating angular dimensions of flight vehicle cockpit canopy casings N86-15886
CASTING
Extrusion cast explosive
[DE85-017785] N86-15417
CATACLYSMIC VARIABLES
Recurrent population 2 X-ray transients - similarities to SU UMa cataclysmic variables
[DE85-014075] N86-16184
CATALYSIS
United States Air Force Academy, Department of Chemistry Research: AY 1983-1984
[AD-A159319] N86-15343
USSR report: Chemistry
[JPRS-UCH-85-013] N86-15344
The catalytic activity and selectivity of chemical treated clinoptilolite in the conversion of methanol N86-15424
CATALYSTS
Extrusion cast explosive
[DE85-017785] N86-15417
CATECHOLAMINE
Investigation of catecholamine metabolism at high altitudes N86-15880
Human thermoregulatory responses to cold air are altered by repeated cold water immersion
[AD-A158871] N86-15904
CATHODE RAY TUBES
Work on putting computer and CRTs in airliner control panels N86-15947
CATHODES
Electrolysis of CO(2) by novel metallopolymeric cathodes
[AD-A158228] N86-15364
Multi-color X-ray line source
[AD-D011910] N86-16088
Investigation of diode physics using an annular magnetically insulated ion diode operated in long pulse mode N86-16097
Magnetic insulation in an ion diode with toroidal magnetic field N86-16099
CAVITATION FLOW
Effects of vibration-induced cavitation of physicochemical characteristics of aircraft fuel N86-15346
A theoretical investigation of acoustic cavitation
[AD-A158058] N86-16042
CAVITIES
Modal analysis of unstable resonators
[AD-A159225] N86-15663
CAVITY RESONATORS
Resonant cavities for stall recovery in gas turbine engines
[AD-D011891] N86-15317
CELLS (BIOLOGY)
Freezing of living cells
[DE85-016297] N86-15862
Investigation of distinctions referable to growth, development and metabolism of Ciosteriopsis acicularis algae when cells are limited in nitrogen as related to biological life-support systems for man N86-15883
CERAMICS
Hot isostatic pressing of ceramics
[NASA-TM-77931] N86-15397
Production of glass or glass-ceramic to metal seals with the applicatin of pressure
[DE85-017746] N86-15403
Radiation effects in actinide host phases
[DE85-016273] N86-16075
A computer simulation of the turbocharged turbo compounded diesel engine system: A description of the thermodynamic and heat transfer models
[NASA-CR-174971] N86-16164
Ceramic automotive Stirling engine study
[NASA-CR-174907] N86-16165
CEREBROSPINAL FLUID
Informativeness of echo signal in pulsed ultrasonography of the brain (with use of model) N86-15887
CERENKOV RADIATION
Experiments in long-wavelength communication using modulated electron beam antennas: A parameter study
[AD-A157810] N86-15519
Observation of microwave Cerenkov radiation as diffraction pattern
[AD-A159337] N86-16057
CHAINS
Towed thermistor chain observations during MILDEX (Mixed Layer Dynamics Experiment)
[AD-A158304] N86-15847
CHANNEL NOISE
A variance detector for signal-gap discrimination in noisy speech channels
[AD-A159227] N86-15527
CHANNELS (DATA TRANSMISSION)
Selection of signals for digital optical channel N86-15471
Lower limit of error probability in discrete addition of binary signals from parallel channels N86-15586
High-speed receivers of microprocessor signal conversion devices N86-15938
Optimum frequency for propagation of sound in shallow sound channels
[AD-A159064] N86-16047
CHARGE COUPLED DEVICES
The detection of faint space object with solid state image detectors
[AD-A158594] N86-16166
CHARGE DISTRIBUTION
The charge-state composition of 0.4-MeV helium ions in Earth's outer radiation belts during quiet times
[AD-A147561] N86-15757
Dependence of charge collection distributions and dose on the gas type filling the ionization chamber for a p(66)Be(49) clinical neutron beam
[DE85-017366] N86-16117
CHARGED PARTICLES
Cosmogenic neutron-capture-produced nuclides in stony meteorites
[DE85-012689] N86-16170
CHARTS
White light solar corona: An atlas of 1984 K-coronameter synoptic charts, December 1983 - January 1985
[PB85-191021] N86-16180
CHEMICAL ANALYSIS
Water resources data for Ohio, water year 1984. Volume 2: St. Lawrence River Basin, statewide project data
[PB85-230233] N86-15719
CHEMICAL BONDS
United States Air Force Academy, Department of Chemistry Research: AY 1983-1984
[AD-A159319] N86-15343
CHEMICAL COMPOSITION
Effects of chemistry and processing on the fracture related properties of P/M alloy CT91
[AD-A159299] N86-15383
Low activation ferritic alloys
[DE85-017795] N86-15384
Variability of major organic components in aircraft fuels
[AD-A159057] N86-15415
Extrusion cast explosive
[DE85-017785] N86-15417
Investigation of microflora of chufa, a potential higher plant component of biological life-support systems for man N86-15882

Cosmogenic neutron-capture-produced nuclides in stony meteorites
[DE85-012689] N86-16170
Theoretical models for Type 1 and Type 2 supernova
[DE85-016288] N86-16174

CHEMICAL EFFECTS
Topical hazard evaluation program of Candidate Insect repellent AI3-35770 Hexahydro-1-((2-Methylcyclohexyl) Carbonyl)-1-H-Azepine
[AD-A158386] N86-15903

CHEMICAL ELEMENTS
Technological applications of Earth core research
[AD-A158991] N86-15759

CHEMICAL ENGINEERING
United States Air Force Academy, Department of Chemistry Research: AY 1983-1984
[AD-A159319] N86-15343

CHEMICAL EXPLOSIONS
Use of chemical explosives for emergency solar flare shelter construction and other excavations on the Martian surface
[DE85-014131] N86-16176

CHEMICAL PROPERTIES
TiN hard coating by reactive ion-plating
[BLL-RISLEY-TR-5112-(9091.9F)] N86-15371
Chemoviscosity modeling for thermosetting resins
[NASA-CR-176409] N86-15395
Technological applications of Earth core research
[AD-A158991] N86-15759

CHEMICAL REACTIONS
Reactions of singlet oxygen with enol esters
[AD-A159160] N86-15342
Laser plus surface-dynamics facility
[AD-A158922] N86-15661

CHEMILUMINESCENCE
Chemiluminescence from organic reactions. Formation of diphenoyl peroxide as an intermediate
[AD-A159144] N86-15341

CHEMISTRY
China report: Science and technology
[JPRS-CST-85-038] N86-15438

CHEMOTHERAPY
Anti-trypanosomal activity of platinum coordination compounds
[AD-D011860] N86-15897

CHESAPEAKE BAY (US)
A comparison of LANDSAT TM to MSS imagery for detecting submerged aquatic vegetation in lower Chesapeake Bay N86-15707

CHILDREN
The Middle Latency Response (MLR) and Steady State Evoked Potential (SSEP) in neonates
[AD-A158007] N86-15900

CHINA
China report: Science and technology
[JPRS-CST-85-040] N86-15478
Remote sensing of severe convective storms N86-15800

CHIPS (ELECTRONICS)
Noise characteristics of stroboscopic transducers built with GaAs microcircuit integration N86-15489

CHIPS (MEMORY DEVICES)
Comparison of 2D memory SEU transport simulations with experiments
[DE85-016134] N86-16137

CHLORINE
Multi-color X-ray line source
[AD-D011910] N86-16088

CHLOROETHYLENE
Development of packed-tower air strippers for trichloroethylene removal at Wurtsmith Air Force Base, Michigan
[AD-A159139] N86-15326

CHROMATOGRAPHY
Improvement of color reproduction by television cameras N86-15581

CHROMIUM
Microstructural control to improve the properties of chromium-molybdenum weld metal
[DE85-016179] N86-15390

CHROMIUM COMPOUNDS
Hydrogen diffusion, positron annihilation in 40CrNiMo steel N86-15439

CIRCUIT BOARDS
Laser technology in manufacture of printed-circuit boards N86-15469
Wide-band single-board analog-digital converter N86-15935
Red-graphic editor in printed circuit board design system N86-15942

CIRCUITS
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-009] N86-15452
Activities report of the Radio Laboratory
[REPT-S-160] N86-15534
Self-guarding Schottky barrier infrared detector array
[AD-D011894] N86-15541
Bipolar digitizer having compression capability
[AD-D011895] N86-15542
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-006] N86-15561
DAASY (data acquisition and analysis system)
[DE85-016341] N86-15971

CIRCULAR CYLINDERS
Instability of time-periodic flows
[NASA-CR-178009] N86-15629
Results of icing flights in winter 1983/84: Ice accretion thickness in correlation with cloud physical parameters, object and cloud parameters
[DFVLR-FB-85-39] N86-15838

CIRCULATION
A conservation law related to Kelvin's circulation theorem
[AD-A157819] N86-15631

CIRCULATION CONTROL ROTORS
Dynamic stability of a bearingless circulation control rotor blade in hover N86-15297
Dynamic response characteristics of a circulation control rotor model pneumatic system N86-15298

CIVIL AVIATION
West Europe report: Science and technology
[JPRS-WST-85-028] N86-15435
West Europe report: Science and technology
[JPRS-WST-85-015] N86-15443
West Europe report: Science and technology
[JPRS-WST-85-024] N86-15447

CLEAN ROOMS
Collection and analysis of NASA clean room air samples
[NASA-CR-3947] N86-15358

CLIMATE
Condensation potential in high thermal performance walls. Hot, humid summer climate
[AD-A158002] N86-15431

CLIMATOLOGY
Analysis of satellite data for sensor improvement (detection of severe storms from space) N86-15796
Kitzingen AI, Germany limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159604] N86-15829
AL Jubayl/Dhahran, Saudi Arabia limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159605] N86-15830
Dakar senegal limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159606] N86-15831
Tahiti Island Pacific limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159607] N86-15832
Pirmasens AHP DL, West Germany limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159608] N86-15833
Revised Uniform Summary of Surface Weather Observations (RUSSWO). Parts A-F Fort Belvoir/Davison AAF, Virginia
[AD-A159609] N86-15834
Yongsan Reservation, Korea limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159610] N86-15835
Activities report in meteorology
[AR-83/84] N86-15836

CLOSED ECOLOGICAL SYSTEMS
Electrolysis of CO(2) by novel metallopolymeric cathodes
[AD-A158228] N86-15364

CLOSURE LAW
Separated transonic airfoil flow calculations with a nonequilibrium turbulence model
[NASA-TM-86830] N86-15247

CLOUD COVER
Utilization of satellite cloud information to diagnose the energy state and transformations in extratropical cyclones N86-15778

CLOUD DISPERSAL
Automated mesoscale winds derived from GOES multispectral imagery N86-15798

CLOUD PHYSICS
Results of icing flights in winter 1983/84: Ice accretion thickness in correlation with cloud physical parameters, object and cloud parameters
[DFVLR-FB-85-39] N86-15838

CLOUDS (METEOROLOGY)
Mesoscale: Cloud scale simulation of convective response N86-15802
Time composite sounding N86-15808
Investigations of severe/tornadic thunderstorm development and evolution based on satellite and AVE/SESAME/VAS data N86-15809
Preliminary planning for the Satellite Precipitaion And Cloud Experiment (SPACE) field program N86-15814
Interactive information processing for NASA's mesoscale analysis and space sensor program N86-15817
First Meeting of the Working Group on the Shuttle Microwave Precipitation Radiometer (SMPR) N86-15820

CLUMPS
The movement of a cluster of particles subject to the effect of gravity and their sedimentation onto a plane horizontal surface
[BLL-RISLEY-TR-5161-(9091.9F)] N86-15623

CMOS
Reducing dynamic errors of integrated-circuit CMOS switches N86-15492
Variable radix processor
[AD-D011893] N86-15918
Comparison of 2D memory SEU transport simulations with experiments
[DE85-016134] N86-16137

COAL
Optical emission line monitor with background observation and cancellation
[DE85-017745] N86-15370
Proposals for acid-rain control from the 98th Congress
[DE85-015268] N86-15744

COAL DERIVED GASES
Novel sorbents for high temperature regenerative H2S removal
[NASA-CR-176449] N86-15360

COAL GASIFICATION
USSR report: Chemistry
[JPRS-UCH-85-013] N86-15344

COAL UTILIZATION
East Europe report: Science and technology
[JPRS-ESA-85-037] N86-15408

COASTAL RANGES (CA)
Airborne Doppler measurements of the central California extended sea breeze N86-15791

COASTAL WATER
Geophysical Bulletin of Hokkaido University, no. 46
[ISSN-0439-3503] N86-15695
Observations on the atmospheric electrical environment of sea fog in the Pacific Coast of Eastern Hokkaido, Japan N86-15697
A numerical simulation of coastal mixed layer by a modified 1-D DKT model N86-15700
Mizlant 84 data report results of an oceanographic cruise to the Greenland Sea, August-September 1984
[AD-A157997] N86-15845

COASTS
Observations on the atmospheric electrical environment of sea fog in the Pacific Coast of Eastern Hokkaido, Japan N86-15697
A numerical simulation of coastal mixed layer by a modified 1-D DKT model N86-15700
Evaluation of spatial, radiometric and spectral Thematic Mapper performance for coastal studies
[E86-10016] N86-15706

COATINGS
Microstructures built from electroactive polymers: Toward a macromolecular electronics
[AD-A159430] N86-15400

COAXIAL CABLES
Digital television routing systems: An introduction to integrated optical waveguide techniques and devices
[BBC-RD-1985/9] N86-15515

COBALT ALLOYS
Microstructural evaluation of 49Co-49Fe-2V alloy
[DE85-016500] N86-15388

COCKPITS
Method of calculating angular dimensions of flight vehicle cockpit canopy casings N86-15886

CODING
Raising the reliability of a remote processing system N86-15928
Random sequential coding by hamming distance
[AD-A158003] N86-15989

COEFFICIENTS
Mechanical properties testing of candidate polymer matrix materials for use in high performance composites
[NASA-CR-177970] N86-15349
Properties of optical filters on CdSe-HgSe base N86-15506

COHERENT RADIATION
Nonlinear analysis of a relativistic beam-plasma cyclotron instability
[AD-A159159] N86-16115

COILS
Ferromagnetic resonance probe liftoff suppression apparatus
[AD-D011913] N86-15647

COLD ACCLIMATIZATION
Human thermoregulatory responses to cold air are altered by repeated cold water immersion
[AD-A158871] N86-15904

COLD WATER
Human thermoregulatory responses to cold air are altered by repeated cold water immersion
[AD-A158871] N86-15904
COLLAPSE
Limit analysis of transversely loaded grillages
[AD-A158988] N86-15692
COLLIMATION
Research in adaptive beamforming for satellite communications
[AD-A157828] N86-15520
COLOR
Improvement of color reproduction by television cameras N86-15581
Color post-processor for the EPIC-2 computer program
[AD-A159321] N86-15961
COLOR PHOTOGRAPHY
A comparison of LANDSAT TM to MSS imagery for detecting submerged aquatic vegetation in lower Chesapeake Bay N86-15707
Use of space shuttle photography in the study of meteorological phenomena
[AD-A159415] N86-15826
COLOR TELEVISION
Digital methods of recording color television images on film tape N86-15579
Color-encoding raster light filters for single-tube color television cameras N86-15580
Improvement of color reproduction by television cameras N86-15581
COLOR VISION
Computational models of human vision with applications
[NASA-CR-176413] N86-15898
COLUMNS (SUPPORTS)
Spring stiffnesses for beam-column analysis of soil-structure interaction problems
[AD-A158072] N86-15690
COMBAT
The airlift dilemma: An update
[AD-A159307] N86-15353
COMBUSTION
Flash X-ray with image enhancement applied to combustion events
[AD-A159328] N86-15369
Optical emission line monitor with background observation and cancellation
[DE85-017745] N86-15370
Geophysical Bulletin of Hokkaido University, no. 46
[ISSN-0439-3503] N86-15695
The reduction of nocturnal cooling value by smudging N86-15696
COMBUSTION CHAMBERS
Scramjet sidewall burning: Preliminary shock tunnel results
[NASA-CR-176420] N86-15337
Fuel effects on soot formation in turbojet engines
[AD-A159073] N86-15416
Research into heat transfer by convection in the chamber of a furnace with relation to the angle at which a high velocity jet strikes a plane surface
[BLLD-M-36478-(5828.4)] N86-15624
Techniques for fatigue life predictions from measured strains
[NASA-CR-178574] N86-15688
COMBUSTION CONTROL
Critical analysis of nitramine decomposition data: Product distributions from HMX and RDX decomposition
[AD-A159325] N86-15368
COMBUSTION PHYSICS
Burning time and size of aluminum, magnesium, zirconium, tantalum, and pyrofuze particles burning in steam
[AD-A159161] N86-15366
Nonlinear diffusion equations
[AD-A158305] N86-15992
Laser produced plasma affects on welding
[DE85-009638] N86-16118
COMBUSTION PRODUCTS
Critical analysis of nitramine decomposition data: Product distributions from HMX and RDX decomposition
[AD-A159325] N86-15368
Spectroscopic studies of detonating heterogeneous explosives
[DE85-007687] N86-15419
COMBUSTION STABILITY
Multi-dimensional combustion instability analysis of solid propellant rocket motors
[AD-A158314] N86-15414
COMMAND LANGUAGES
MC68000 monitor program disassembled N86-15479
COMMUNICATION
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-009] N86-15452
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-011] N86-15484
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-006] N86-15561
COMMUNICATION NETWORKS
Main trends in satellite communication and broadcasting research N86-15494
Host groups: A multicast extension for datagram internetworks
[AD-A159146] N86-15526
A research program in computer technology
[AD-A157991] N86-15920
COMMUNICATION SATELLITES
Research in adaptive beamforming for satellite communications
[AD-A157828] N86-15520
COMMUNICATION THEORY
Mathematical problems in stability, control and reliability of random access communication systems
[AD-A159402] N86-15529
Efficiency of storing pulse products in coherent signal packets N86-15584
COMMUTATORS
Reducing dynamic errors of integrated-circuit CMOS switches N86-15492
COMPACTING
Mach stem characterization in Mbar designs using RSR powder
[DE85-015700] N86-15385
COMPARATOR CIRCUITS
Design of differential circuit for LSI N-threshold comparator N86-15583
COMPARATORS
Bipolar digitizer having compression capability
[AD-D011895] N86-15542
COMPARISON
Comparison of the Air Force female and male pilot grounded time in the Air Force Military Airlift Command
[AD-A158093] N86-15902
COMPILERS
Silicon compiler design of combinational and pipeline adder integrated circuits
[AD-A158995] N86-15555
Ada (trade name) compiler validation summary report: Rational environment, version A.2.0.6 for rational R1000
[AD-A157830] N86-15949
COMPLEX SYSTEMS
Problems of devloping algorithmic design system N86-15939
COMPLEXITY
On the assignment algorithm by means of multi-linked data structure N86-15426
COMPOSITE MATERIALS
Advanced Integrated Power and Attitude Control System (IPACS) study
[NASA-CR-3912] N86-15338
Energy function and conductivity of metal-polymer composites N86-15347
Stress concentration around a small circular hole in the HiMAT composite plate
[NASA-TM-86038] N86-15350
Corrosion resistant magnesium-based materials for naval applications
[AD-A158012] N86-15351
Studies of molecular properties of polymeric materials: Aerospace environmental effects on three linear polymers
[NASA-TM-87532] N86-15391
Effects of load proportioning on the capacity of multiple-hole composite joints
[NASA-CR-178019] N86-15687
COMPOSITE STRUCTURES
Test results from a dynamic model dynaflex rotor N86-15285
Effect of stress concentrations in composite structures
[NASA-CR-176410] N86-15348
Elastic bearing
[AD-A159140] N86-15672
COMPRESSIBILITY
Simultaneous incremental strain/incremental temperature analog device for, and method, of testing for stress response
[AD-D011912] N86-15411
COMPRESSIBLE FLOW
Numerical solutions for three-dimensional cases: Swept wings N86-15263
Analysis of the effects of transient heat transfer on axial flow compressor blade boundary layers
[AD-A158094] N86-15315
Wave motion analysis of a nonspinning liquid filled cylinder
[AD-A159324] N86-15636
COMPRESSING
The effect of environmental stress on Sylgard 170 silicone elastomer
[TI85-013268] N86-15407
Bipolar digitizer having compression capability
[AD-D011895] N86-15542
Self-consistent approximation for squeezing generation in a nonlinear optical medium
[NOTA-INTERNA-845] N86-16094
Pulse power transport to REB diode through slender MITL N86-16100
Geometric compression of hollow cylinder in a coaxial relativistic electron beam diode N86-16101
COMPRESSION LOADS
Effect of stress concentrations in composite structures
[NASA-CR-176410] N86-15348
COMPRESSIVE STRENGTH
Design of foundations in permafrost
[AD-A158063] N86-15433
COMPRESSOR BLADES
Analysis of the effects of transient heat transfer on axial flow compressor blade boundary layers
[AD-A158094] N86-15315
COMPTON EFFECT
Flash X-ray with image enhancement applied to combustion events
[AD-A159328] N86-15369
COMPUTATION
Outer product calculations
[AD-A158295] N86-15991
ANL/Star Project: A new architecture for large scale theoretical physics computations
[DE85-014988] N86-16144
COMPUTATIONAL FLUID DYNAMICS
Test cases for inviscid flow field methods
[AGARD-AR-211] N86-15256
Numerical methods N86-15259
Exact solutions to transonic and supersonic flows N86-15260
Numerical solutions of two-dimensional reference test cases N86-15262
Computational fluid dynamics at NASA Ames and the numerical aerodynamic simulation program
[NASA-TM-86769] N86-15626
Adaptive grid generation using elliptic generating equations with precise coordinate controls
[AD-A159158] N86-16002
COMPUTATIONAL GRIDS
Numerical methods N86-15259
Numerical solutions of two-dimensional reference test cases N86-15262
Concluding remarks N86-15265
Adaptive grid generation using elliptic generating equations with precise coordinate controls
[AD-A159158] N86-16002
COMPUTER AIDED DESIGN
Optimal design application on the advanced aeroelastic rotor blade N86-15290
Development and application of a time-history analysis for rotorcraft dynamics based on a component approach N86-15291
Restructuring the rotor analysis program C-60 N86-15292
PIFCGT: A PIF autopilot design program for general aviation aircraft
[NASA-CR-166123] N86-15320
Activities report of the Radio Laboratory
[REPT-S-160] N86-15534
VLSI (Very Large Scale Integrated) design of a sixteen bit pipelined multiplier using three micron NMOS technology
[AD-A159433] N86-15557
Visual display parameters
[AD-A158773] N86-15654
KBEmacs (Knowledge-Based Editor in emacs): A step toward the programmer's apprentice
[AD-A157814] N86-15948
Application and implementation of transient algorithms in computer programs
[DE85-015396] N86-15968
Algorithms and software for pole assignment and observers, revision 1
[DE85-016068] N86-15970
Computer-assisted program design
[DE85-015315] N86-15973
Expert systems in engineering practice
[ISBN-90-6818-018-5] N86-15977
COMPUTER DESIGN
Program base for raster display N86-15937
COMPUTER GRAPHICS
A rapid method for estimating equivalent parabolic polars from wind-tunnel tests
[AD-A159559] N86-15251
Computer vision research and its applications to automated cartography
[AD-A159435] N86-15713
Airborne Doppler lidar activities N86-15793

Demonstrate capabilities of digital graphics system to obtain quantitative information from flow visualization data
[AD-A158760] N86-15923
Program base for raster display N86-15937
Red-graphic editor in printed circuit board design system N86-15942
Color post-processor for the EPIC-2 computer program
[AD-A159321] N86-15961
CAT: An interactive graphics code
[DE85-016212] N86-15967
Application and implementation of transient algorithms in computer programs
[DE85-015396] N86-15968
EPIC/JANUS user's guide
[DE85-017027] N86-16158

COMPUTER INFORMATION SECURITY
Computer security policies
[GPO-52-154] N86-15919

COMPUTER NETWORKS
East Europe report: Science and technology
[JPRS-ESA-85-033] N86-15473
Call to expand information network for basic research N86-15475
Studies of lightning data in conjunction with geostationary satellite data N86-15785
Atmospheric Modeling And Sensor Simulation (AMASS) study N86-15815
USSR report: Cybernetics, computers and automation technology
[JPRS-UCC-85-004] N86-15927
Modeling problem-oriented multiprocessor systems N86-15932
Ada (trade name) compiler validation summary report: Rational environment, version A.2.0.6 for rational R1000
[AD-A157830] N86-15949
Microcomputer networking in libraries. Report of a study visit to the United States 14th October 1983
[BLRDR-5819] N86-15976
Modeling network data structures in relational-like data base management systems
[DE85-015803] N86-16156

COMPUTER PROGRAMMING
KBEmacs (Knowledge-Based Editor in emacs): A step toward the programmer's apprentice
[AD-A157814] N86-15948
The LOGLISP programming system
[AD-A158011] N86-15950
Representing time and space in an object oriented hardware description language
[AD-A158226] N86-15952
Programming productivity enhancement by the use of application generators by the use of application generators
[AD-A158590] N86-15953
Running ROSS in an Emacs environment
[AD-A159567] N86-15966
Distributed FIFO allocation of identical resources using small shared space
[AD-A159151] N86-15978

COMPUTER PROGRAMS
Ground resonance analysis using a substructure modeling approach N86-15282
Parametric study of the aeroelastic stability of a bearingless rotor N86-15283
Development of an unsteady aerodynamics model to improve correlation of computed blade stresses with test data N86-15288
Restructuring the rotor analysis program C-60 N86-15292
Planning, creating and documenting a NASTRAN finite element model of a modern helicopter N86-15300
PIFCGT: A PIF autopilot design program for general aviation aircraft
[NASA-CR-166123] N86-15320
Programming a multiple-orifice hydraulic decelerator
[AD-A159428] N86-15328
Thermal-mechanical fatigue test apparatus for metal matrix composites and joint attachments
[NASA-TM-87187] N86-15378
Repair, evaluation, maintenance, and rehabilitation research program. The condition of Corps of Engineers civil works concrete structures
[AD-A157992] N86-15430
China report: Science and technology
[JPRS-CST-85-038] N86-15438
Microprocessor application in error code correction N86-15480
Basic research in reliability for real systems
[AD-A159100] N86-15681
Limit analysis of transversely loaded grillages
[AD-A158988] N86-15692
User's manual for Massachusetts Institute of Technology Solar Thermal Pond Program (MITSOL)
[DE85-012147] N86-15733
Automated mesoscale winds derived from GOES multispectral imagery N86-15798
LAMPS software and mesoscale prediction studies N86-15801
Mesoscale research activities with the LAMPS model N86-15803
Cooperative VAS program with NASA Marshall Space Flight Center N86-15804
Atmospheric Modeling And Sensor Simulation (AMASS) study N86-15815
A design study for a three-dimensional display computer terminal for meteorological information N86-15816
Automatic determination of cardiac output from rheogram of the trunk N86-15889
USSR report: Cybernetics, computers and automation technology
[JPRS-UCC-85-004] N86-15927
Microelectronics technology N86-15930
Possibility of artificial intelligence in computers N86-15944
A design evaluation checklist for user-system interface software
[AD-A158599] N86-15954
An interactive discrete controls analysis option (ORACLS) for the CONTROLS analysis package on the IBM 3033
[AD-A158754] N86-15956
An implementation in Pascal: Translation of Prolog into Pascal
[AD-A159552] N86-15965
CAT: An interactive graphics code
[DE85-016212] N86-15967
PETROS: A progam for calculating transport of heat, water, water vapor and air through a porous material
[DE85-013168] N86-15972
Computer-assisted program design
[DE85-015315] N86-15973
Hypercube concurrent computation and virtual time for robotic application
[DE85-009479] N86-15979
A computer program for analyzing loglinear models with latent variables: LCAG N86-16026
The broadband normal mode model PROTEUS
[AD-A159091] N86-16048
Molecular processes in a high temperature shock layer
[NASA-CR-176357] N86-16054
ANL/Star Project: A new architecture for large scale theoretical physics computations
[DE85-014988] N86-16144
Queueing network systems with unbalanced flows and their applications to performance evaluation of highly parallel distributed information systems: Revision
[AD-A158052] N86-16154

COMPUTER STORAGE DEVICES
Variable radix processor
[AD-D011893] N86-15918
Database theory
[AD-A158975] N86-15925

COMPUTER SYSTEMS DESIGN
Managing computer systems development: Understanding the human and technological imperatives
[AD-A158976] N86-15917
A research program in computer technology
[AD-A157991] N86-15920
Microelectronics technology N86-15930
Problems of devloping algorithmic design system N86-15939
Algorithms and software for pole assignment and observers, revision 1
[DE85-016068] N86-15970
ANL/Star Project: A new architecture for large scale theoretical physics computations
[DE85-014988] N86-16144

COMPUTER SYSTEMS PERFORMANCE
Development and evaluation of a regional seismic array in Norway
[AD-A159129] N86-15761
An interactive discrete controls analysis option (ORACLS) for the CONTROLS analysis package on the IBM 3033
[AD-A158754] N86-15956

COMPUTER SYSTEMS PROGRAMS
Managing computer systems development: Understanding the human and technological imperatives
[AD-A158976] N86-15917
Running ROSS in an Emacs environment
[AD-A159567] N86-15966
Algorithms and software for pole assignment and observers, revision 1
[DE85-016068] N86-15970
A computer model of peripheral auditory processing
[NPL-DITC-58/85] N86-16037

COMPUTER TECHNIQUES
Repair, evaluation, maintenance, and rehabilitation research program. The condition of Corps of Engineers civil works concrete structures
[AD-A157992] N86-15430
Use and application of computers in construction estimating
[AD-A158055] N86-15921
Belorussian computer speaks, reads graphics, X-rays N86-15945
Programming productivity enhancement by the use of application generators by the use of application generators
[AD-A158590] N86-15953
A design evaluation checklist for user-system interface software
[AD-A158599] N86-15954
The ISIS project: R and D status and technical report
[AD-A158930] N86-15959
Operational methods for data interpolation
[DE85-016050] N86-15969
Distributed FIFO allocation of identical resources using small shared space
[AD-A159151] N86-15978
LaPlace transformation with REDUCE 2
[INPE-3649-PRE/816] N86-15985
Isolated data acquisition system for high voltage applications
[DE85-016984] N86-16116

COMPUTER VISION
Computer vision research and its applications to automated cartography
[AD-A159435] N86-15713
A model of an expert computer vision and recognition facility with applications of a proportion technique
[AD-A158073] N86-15922
Possibility of artificial intelligence in computers N86-15944

COMPUTERIZED SIMULATION
Use of hinged strakes for lateral control at high angles of attack
[AD-A158005] N86-15321
Concepts for the development of a nondestructive testing and evaluation system for rigid airfield pavements
[AD-A158004] N86-15324
Real-time digital terrain image generator
[AD-A159316] N86-15327
On the assignment algorithm by means of multi-linked data structure N86-15426
Finite-difference electrodynamic analysis of a tapering coaxial waveguide incorporating a dielectric wedge-shaped lens for concentrating Transverse Electromagnetic (TEM) waves
[SAND-84-2062] N86-15517
Investigations of the interference scattering and methods for its suppression in near-ground radar backscattering measurements
[DFVLR-FB-85-42] N86-15539
A brief investigation of adaptive decision feedback equalization for digital HF links employing PSK (Phase Shift Keying) modulation
[AD-A157809] N86-15545
Computational fluid dynamics at NASA Ames and the numerical aerodynamic simulation program
[NASA-TM-86769] N86-15626
Numerical study of the laminar shock boundary layer interaction
[DFVLR-FB-85-34] N86-15642
Activities and results report for the special domain 210 --- fluid mechanics
[KU-SFB-210/A/11] N86-15645
Balancing of a rod using a digitally controlled robot
[DFVLR-FB-85-41] N86-15677
Limit analysis of transversely loaded grillages
[AD-A158988] N86-15692
Mesoscale research activities with the LAMPS model N86-15803
Numerical simulation of convective response to mesoscale forcing N86-15806
Wave and surf forecast model evaluation for use on a micro computer
[AD-A159063] N86-15848
A computer model of driver response
[UTIAS-293] N86-15911
A computer model of case-based reasoning in problem solving: An investigation in the domain of dispute mediation
[AD-A158097] N86-15912
Demonstrate capabilities of digital graphics system to obtain quantitative information from flow visualization data
[AD-A158760] N86-15923
Problem solving under time-constraints
[AD-A158921] N86-15957

Implementation of a serial delay insertion type loop communication for a real time multitransputer system [AD-A158980] N86-15960
A target tracker using a Doppler compensated correlation technique [AD-A158087] N86-15990
Computer simulation of nonequilibrium processes [DE85-015708] N86-16036
TOM: A program for interactive lattice design [DE85-016988] N86-16077
Computational needs for modelling accelerator components [DE85-015262] N86-16082
PBFA-2 vacuum system design using a lumped parameter computer model [DE85-013117] N86-16125
Modeling network data structures in relational-like data base management systems [DE85-015803] N86-16156
A computer simulation of the turbocharged turbo compounded diesel engine system: A description of the thermodynamic and heat transfer models [NASA-CR-174971] N86-16164

COMPUTERS
China report: Science and technology [JPRS-CST-85-040] N86-15478
USSR report: Electronics and electrical engineering [JPRS-UEE-85-011] N86-15484
USSR report: Cybernetics, computers and automation technology [JPRS-UCC-85-004] N86-15927
Representing time and space in an object oriented hardware description language [AD-A158226] N86-15952
National Science Foundation authorization, 1986 [GPO-46-945] N86-16162

CONCRETES
Repair, evaluation, maintenance, and rehabilitation research program. The condition of Corps of Engineers civil works concrete structures [AD-A157992] N86-15430

CONDENSATION
Condensation potential in high thermal performance walls. Hot, humid summer climate [AD-A158002] N86-15431

CONDUCTION ELECTRONS
Redox capacity and dc electron conductivity in electroactive materials [AD-A159431] N86-15401
Micron-spaced platinum interdigitated array electrode: Fabrication, theory and initial use [AD-A159429] N86-15556

CONDUCTORS
Effect of conductor profile on force characteristics due to motion of a magnetic field source N86-15607

CONFERENCES
Summaries of Center for Fire Research grants and in-house programs, 1985 [NBSIR-85-3258] N86-15429
Controlling acidic deposition: Targeted strategies for reducing sulfur dioxide emissions [DE85-015056] N86-15742
Proposals for acid-rain control from the 98th Congress [DE85-015266] N86-15744

CONFORMAL MAPPING
Standardization of Schwarz-Christoffel transformation for engineering design of semiconductor and hybrid integrated-circuit elements N86-15620

CONGRESSIONAL REPORTS
Congressional Workshop on Advanced Materials Research and Development [GPO-47-717] N86-15340
Biotechnology and agriculture [GPO-48-672] N86-15712
Computer security policies [GPO-52-154] N86-15919
National Science Foundation authorization, 1986 [GPO-46-945] N86-16162
National Aeronautics and Space Administration authorization for fiscal year 1986 [S-HRG-99-102] N86-16163

CONSERVATION LAWS
A conservation law related to Kelvin's circulation theorem [AD-A157819] N86-15631

CONSISTENCY
A consistent spatial differencing scheme for the transonic full-potential equation in three dimensions [NASA-TM-86716] N86-15246

CONSOLIDATION
The permeability and consolidation of deep sea sediments [IOS-201] N86-15855

CONSTRUCTION INDUSTRY
Use and application of computers in construction estimating [AD-A158055] N86-15921

CONTAINMENT
Probabilistic analysis of steel containment strength with internal pressure [DE85-015520] N86-15389

CONTAMINANTS
Aircraft accident report: Vieques Air Link, Inc., Britten-Norman BN-21-6 Islander, N589SA, Vieques, Puerto Rico, August 2, 1984 [PB85-901408] N86-15276
Collection and analysis of NASA clean room air samples [NASA-CR-3947] N86-15358

CONTAMINATION
Catalytic surface effects on contaminated space shuttle tile in a dissociated nitrogen stream [NASA-TM-86770] N86-15335
Determining probabilities of geologic events and processes [TI85-014642] N86-15762

CONTINENTAL SHELVES
Mizlant 84 data report results of an oceanographic cruise to the Greenland Sea, August-September 1984 [AD-A157997] N86-15845

CONTINUOUS NOISE
Estimating number and parameters of signal components in presence of noise N86-15567

CONTINUOUS WAVE RADAR
Multiscale modeling to evaluate proposed space-based Doppler lidar sampling strategies N86-15774

CONTOURS
Description, analysis, and prediction of sea-floor roughness using spectral models [AD-A158000] N86-15846

CONTRAST
LANDSAT-4 Thematic Mapper Modulation Transfer Function (MTF) evaluation [E86-10017] N86-15710
Visual sensitivities and discriminations and their roles in aviation [AD-A158962] N86-15907

CONTROL BOARDS
Raising the reliability of a remote processing system N86-15928
Work on putting computer and CRTs in airliner control panels N86-15947

CONTROL DATA (COMPUTERS)
An interactive discrete controls analysis option (ORACLS) for the CONTROLS analysis package on the IBM 3033 [AD-A158754] N86-15956

CONTROL EQUIPMENT
Novel control circuit for proximity focused microchannel plate image intensifiers N86-15481
USSR report: Electronics and electrical engineering [JPRS-UEE-85-011] N86-15484
Principles and problems of building dc electric drives with symistor control N86-15598

CONTROL STABILITY
Prediction of wing aeroelastic effects on aircraft lift and pitching moment characteristics [NASA-TM-87631] N86-15319

CONTROL SYSTEMS DESIGN
Control system design for cryogenic wind tunnel by performance vector performance [DFVLR-FB-85-37] N86-15329
Progress on combined load- and profile-control for horizontal-turret, single- and double-arm tunnelling machines [RR-276] N86-15674
Microelectronics technology N86-15930
Functional-logical system for automated planning of robot production line control systems N86-15940
Automated flaw detection information-measuring system N86-15941

CONTROL THEORY
USSR report: Electronics and electrical engineering [JPRS-UEE-85-006] N86-15561
On the optimal control of nonlinear systems [RR-278] N86-15981
Nonlinear control of distributed parameter systems [INPE-3823-PRE/807] N86-15986
Control of nonlinear distributed parameter systems [INPE-3824-PRE/808] N86-15987

CONTROL UNITS (COMPUTERS)
Digital servocontroller system. Volume 2. Maintenance manual [AD-A159066] N86-15322

CONTROL VALVES
Dynamic response characteristics of a circulation control rotor model pneumatic system N86-15298

CONTROLLED ATMOSPHERES
Investigation of mineral nutrition of a new form of microalgae to be used in biological life-support systems N86-15892

CONVECTION
NASA/MSFC FY-85 Atmospheric Processes Research Review [NASA-CP-2402] N86-15769
A conceptual model of the severe-storm environment for inclusion into Air Weather Service severe-storm analysis and forecast procedures [AD-A158010] N86-15824
Nonlinear diffusion equations [AD-A158305] N86-15992

CONVECTION CLOUDS
Remote sensing of severe convective storms N86-15800
Mesoscale: Cloud scale simulation of convective response N86-15802
Severe storm identification with satellite microwave radiometry: An initial investigation with Nimbus-7 SMMR data [NASA-CR-176431] N86-15821

CONVECTIVE FLOW
Theoretical and experimental studies in support of the Geophysical Fluid Flow Experiment N86-15772
Mesoscale: Cloud scale simulation of convective response N86-15802
Numerical simulation of convective response to mesoscale forcing N86-15806
A summary of research on mesoscale energetics of severe storm environments N86-15807

CONVECTIVE HEAT TRANSFER
Research into heat transfer by convection in the chamber of a furnace with relation to the angle at which a high velocity jet strikes a plane surface [BLLD-M-36478-(5828.4)] N86-15624
Response of the mesoscale atmosphere to diabatic heating N86-15794
LAMPS software and mesoscale prediction studies N86-15801

CONVERGENCE
Stochastic differential equations for neuronal behavior [AD-A159099] N86-15908
Sieves and a filter for Gaussian processes [AD-A158762] N86-15994
Strong representation of weak convergence [AD-A159078] N86-16000
Rapidly convergent algorithms for nonsmooth optimization [AD-A159168] N86-16005

COOLING
Development of radiative cooling materials, phase 3 [DE85-014666] N86-15404
Solar-pumped solid state Nd lasers [NASA-TM-87615] N86-15658
Power combiners/dividers for loop pickup and kicker arrays FNAL stochastic cooling rings [DE85-016562] N86-16121

COORDINATES
Adaptive grid generation using elliptic generating equations with precise coordinate controls [AD-A159158] N86-16002

COPOLYMERS
Demonstration of a pyroelectric conversion power cycle with a polymer [AD-A158864] N86-15398

COPPER
Textured carbon on copper: A novel surface with extremely low secondary electron emission characteristics [NASA-TP-2543] N86-15394
East Europe report: Science and technology [JPRS-ESA-85-037] N86-15408
Pulsed septum magnet for the Fermilab antiproton source [DE85-016993] N86-16078
Multi-color X-ray line source [AD-D011910] N86-16088

COPPER ALLOYS
Spin dynamics of a Cu-Mn spin glass alloy [DE85-016295] N86-16134

CORRELATION
A review of dynamic inflow and its effect on experimental correlations N86-15293

CORRELATION DETECTION
Correlations between signals from gravitational wave antennas in Rome and in Geneva [PREPRINT-482] N86-15533

CORROSION PREVENTION
Corrosion resistant magnesium-based materials for naval applications [AD-A158012] N86-15351

CORROSION RESISTANCE
Thermally, chemically resistant enamels N86-15409

CORTISONE
Effect of dry immersion model on parameters of fluid-electrolyte metabolism, blood plasma aldosterone and cortisol levels in individuals differing in body fluid content N86-15875

COSMIC PLASMA
Cosmogonic scenario
[TRITA-EPP-85-04] N86-16175

COSMIC RAYS
Radiation mapping on Spacelab 1: Experiment no. INS006
[NASA-CR-171893] N86-15332
Absolute measurements of antenna parameters by illumination method N86-15511
Use of chemical explosives for emergency solar flare shelter construction and other excavations on the Martian surface
[DE85-014131] N86-16176

COSMOLOGY
Black holes, pregalactic stars and the dark matter problem
[DE85-015385] N86-16168
Cosmogonic scenario
[TRITA-EPP-85-04] N86-16175
Further explorations of cosmogonic shadow effects in the Saturnian rings
[NASA-CR-176441] N86-16177

COST ANALYSIS
System engineering and energy cost analysis of small and medium wind turbines
[DE85-012159] N86-15738
Ceramic automotive Stirling engine study
[NASA-CR-174907] N86-16165

COST EFFECTIVENESS
Advanced Integrated Power and Attitude Control System (IPACS) study
[NASA-CR-3912] N86-15338
Moldable electrically conductive polymer compositions
[AD-D011887] N86-15402
Raising the reliability of a remote processing system N86-15926

COST ESTIMATES
Use and application of computers in construction estimating
[AD-A158055] N86-15921

COSTS
Light helicopter family trade-off analysis. Volume 10: Appendices V, W, X, and Z
[AD-A158079] N86-15309

COULOMB POTENTIAL
The application of diffusion theory to the analysis of hydrogen desorption data at 25 deg C
[NASA-TM-86531] N86-15359

COUPLING
Coupled high power waveguide laser research
[AD-A159079] N86-15662
Triple pendulum for the demonstration of nonlinear coupling
[LAB-REPT-763] N86-16032
Triple pendulum for the demonstration of nonlinear coupling N86-16033
A multiple pendulum for the demonstration of nonlinear coupling N86-16034

COUPLINGS
Parametric study of the aeroelastic stability of a bearingless rotor N86-15263

COVARIANCE
A new approach to signal registration with the emphasis on variable time delay estimation N86-15514
Sieves and a filter for Gaussian processes
[AD-A158762] N86-15994
Inadmissibility of the best equivariant estimators of the variance-covariance matrix and the generalized variance under entropy loss
[AD-A159059] N86-16020

CRACK INITIATION
The role of microstructure in hydrogen-assisted crack initiation in high strength steels N86-15375
Investigations of the relations between the damage evolution of vibrationally loaded samples and the measuring quantities of the instrumented accelerated fatigue test during the crackfree fatigue phase and microcrack formation phase N86-15694

CRACK PROPAGATION
Application of fracture mechanics principles to fatigue crack growth in a powder metallurgy Ni-base superalloy N86-15372
Combined mode 1 - mode 3 fracture toughness of high-strength low-alloy steel N86-15376
Crystallographic fatigue crack propagation in single crystal nickel-base superalloy N86-15377
Effects of chemistry and processing on the fracture related properties of P/M alloy CT91
[AD-A159299] N86-15383

CRACK TIPS
Crystallographic fatigue crack propagation in single crystal nickel-base superalloy N86-15377

CRASHES
Aircraft accident report: Vieques Air Link, Inc., Britten-Norman BN-21-6 Islander, N589SA, Vieques, Puerto Rico, August 2, 1984
[PB85-901408] N86-15276

CRASHWORTHINESS
Light helicopter family trade-off analysis. Volume 10: Appendices V, W, X, and Z
[AD-A158079] N86-15309

CRAY COMPUTERS
CAT: An interactive graphics code
[DE85-016212] N86-15967
Performance of various computers using standard linear equations software in a FORTRAN environment
[DE85-015336] N86-15974
Code developer's guide to the Styx Liaison Library: A software interface for accessing and manipulating Styx opacity data
[DE85-014253] N86-16160

CREEP RUPTURE STRENGTH
Creep rupture behavior of Stirling engine materials
[NASA-TM-87209] N86-15380

CRITICAL FREQUENCIES
Adiabatic invariant value variation under shortwave band subcritical conditions N86-15572

CROSS COUPLING
An analysis of cross-coupling of a multicomponent jet engine test stand using finite element modeling techniques
[NASA-CR-176424] N86-15323

CROSS FLOW
Boundary-layer transition: T-S waves and crossflow mechanisms N86-15266
F-111 natural laminar flow glove flight test data analysis and boundary layer stability analysis
[NASA-CR-166051] N86-15305
Heat transfer characteristics within an array of impinging jets. Effects of crossflow temperature relative to jet temperature
[NASA-CR-3936] N86-15625

CROSS SECTIONS
Programming a multiple-orifice hydraulic decelerator
[AD-A159428] N86-15328

CRYOGENIC COOLING
BASD: SIRTF Telescope Instrument Changeout and Cryogen Replenishment (STICCR) study
[NASA-CR-177381] N86-15334
Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams
[IPPJ-742] N86-16096
Experiments on cryogenic pulsed ion sources N86-16098

CRYOGENIC EQUIPMENT
Correlations between signals from gravitational wave antennas in Rome and in Geneva
[PREPRINT-462] N86-15533

CRYOGENIC WIND TUNNELS
Control system design for cryogenic wind tunnel by performance vector performance
[DFVLR-FB-85-37] N86-15329

CRYOGENICS
Cryogenic sample stage for the CAMECA IMS-3F ion microscope
[AD-A158071] N86-15362
East Europe report: Science and technology
[JPRS-ESA-85-033] N86-15473
Scientists cite uses of cryogenics, low temperature measurement N86-15477
Research on the crystal growth and dielectric properties of high permittivity ferroelectric materials
[AD-A157820] N86-16126
Thin superconducting film characterization by surface acoustic waves
[AD-A158311] N86-16127

CRYSTAL DEFECTS
Heterogeneous response of aluminum and lithium niobate to shock waves
[DE85-013963] N86-16140

CRYSTAL GROWTH
Research on the crystal growth and dielectric properties of high permittivity ferroelectric materials
[AD-A157820] N86-16126
Structural examination of iridium-based single-crystal preparations
[DE85-017550] N86-16136

CRYSTAL LATTICES
Standard X-ray diffraction powder patterns
[NBS/MN-25-SEC-21] N86-15357
Test for a possible melting transition in grain boundaries in aluminum near the melting point
[DE85-013238] N86-15387
Investigation of quantum effects in heterostructures
[AD-A158327] N86-15550
Statistical model for the trapping of interstitials by substitutional (interstitial) atoms in solids
[PREPRINT-442] N86-16141

CRYSTALLOGRAPHY
Crystallographic fatigue crack propagation in single crystal nickel-base superalloy N86-15377
Structural and electrical characterization of polycrystalline semiconductor materials
[DE85-012166] N86-16135

CRYSTALS
Crystal analyser mirror type down-scattering spectrometer using spallation neutron source N86-15425

CUBIC LATTICES
Structural transformations in semiconductors during optical pumping N86-15490
Theoretical studies in nondestructive evaluation (NDE)
[AD-A159155] N86-15662

CUMULUS CLOUDS
Response of the mesoscale atmosphere to diabatic heating N86-15794

CURRENT CONVERTERS (AC TO DC)
Input current shaped ac-to-dc converters
[NASA-CR-176436] N86-15544

CURRENT DISTRIBUTION
Internal conditions for self excitation of superconductor DC generators N86-15606

CURVE FITTING
A rapid method for estimating equivalent parabolic polars from wind-tunnel tests
[AD-A159559] N86-15251
Profile fitting in residual stress determination
[AD-A158881] N86-15691

CYBERNETICS
USSR report: Cybernetics, computers and automation technology
[JPRS-UCC-85-004] N86-15927
USSR report: Cybernetics, computers and automation technology
[JPRS-UCC-85-009] N86-15943

CYCLIC COMPOUNDS
Reactions of singlet oxygen with enol esters
[AD-A159160] N86-15342

CYCLONES
Variation objective analyses for cyclone studies N86-15777
Utilization of satellite cloud information to diagnose the energy state and transformations in extratropical cyclones N86-15778
Dynamics and energetics of the South Pacific Convergence Zone during FGGE SOP-1 N86-15779

CYCLOTRON RADIATION
Nonlinear analysis of a relativistic beam-plasma cyclotron instability
[AD-A159159] N86-16115

CYCLOTRON RESONANCE DEVICES
Self-modulation instability of gyrotron emission N86-15501

CYLINDRICAL ANTENNAS
Longitudinally slotted cylindrical shield with finite thickness and electrical conductance N86-15483
Effect of cylindrical reradiator on parameters of antenna and antenna array N86-15574

CYLINDRICAL BODIES
The experimental determination of the subsonic aerodynamic characteristics of an Ogive-Cylinder body including a comparison with theoretical estimates, volume 1
[CAR-8509] N86-15242
Programming a multiple-orifice hydraulic decelerator
[AD-A159428] N86-15328
Wave motion analysis of a nonspinning liquid filled cylinder
[AD-A159324] N86-15836

CYTOCHROMES
Application of electron-transfer theory to several systems of biological interest
[DE85-015835] N86-15860

CYTOGENESIS
Effect of 24,25-dihydroxyvitamin D3 on osteogenetic precursor cells in immobilized rats N86-15877

D

DAMAGE
Development and application of a time-history analysis for rotorcraft dynamics based on a component approach N86-15291
Repair, evaluation, maintenance, and rehabilitation research program. The condition of Corps of Engineers civil works concrete structures
[AD-A157992] N86-15430

Investigations of the relations between the damage evolution of vibrationally loaded samples and the measuring quantities of the instrumented accelerated fatigue test during the crackfree fatigue phase and microcrack formation phase N86-15694

DAMPING

A review of dynamic inflow and its effect on experimental correlations N86-15293

The influence of dynamic inflow and torsional flexibility on rotor damping in forward flight from symbolically generated equations N86-15295

DATA ACQUISITION

Performance and loads data from a hover test of a full-scale XV-15 rotor
[NASA-TM-86833] N86-15243

SAR (Synthetic Aperture Radar) data collection and processing summary - 1984 SARSEX (SAR internal wave signature experiment) experiment
[AD-A159440] N86-15530

Storm severity detection (RF) N86-15784

The assimilation of satellite soundings, winds and satellite products in a mesoscale analysis forecast system N86-15805

DAASY (data acquisition and analysis system)
[DE85-016341] N86-15971

Research and development of an aimed magnetic lead current density-magnetic field diagnostic
[DE85-014720] N86-16060

Isolated data acquisition system for high voltage applications
[DE85-016984] N86-16116

DATA BASE MANAGEMENT SYSTEMS

Computer-assisted program design
[DE85-015315] N86-15973

Modeling network data structures in relational-like data base management systems
[DE85-015803] N86-16156

Logical and physical database design with a full-text environment
[DE85-015683] N86-16159

Code developer's guide to the Styx Liaison Library: A software interface for accessing and manipulating Styx opacity data
[DE85-014253] N86-16160

DATA BASES

East Europe report: Science and technology
[JPRS-ESA-85-037] N86-15408

Repair, evaluation, maintenance, and rehabilitation research program. The condition of Corps of Engineers civil works concrete structures
[AD-A157992] N86-15430

Studies of lightning data in conjunction with geostationary satellite data N86-15785

Database theory
[AD-A158975] N86-15925

Dynamic monotone priorities on planar sets (extended abstract)
[AD-A158610] N86-15955

Vitamin-E 174N,38G general purpose cross-section library
[DE85-013110] N86-16161

DATA FLOW ANALYSIS

Data flow graph optimization in IF1
[DE85-007979] N86-15975

DATA PROCESSING

Naval space surveillance modernized receiver system. Volume 6: Data communications subsystem
[AD-A158465] N86-15523

Ultimate limits of FT-IR
[DE85-016442] N86-15652

Development and evaluation of a regional seismic array in Norway
[AD-A159129] N86-15761

Automated mesoscale winds derived from GOES multispectral imagery N86-15798

Time composite sounding N86-15808

Atmospheric Modeling And Sensor Simulation (AMASS) study N86-15815

Interactive information processing for NASA's mesoscale analysis and space sensor program N86-15817

Variable radix processor
[AD-D011893] N86-15918

Database theory
[AD-A158975] N86-15925

Automated flaw detection information-measuring system N86-15941

A design evaluation checklist for user-system interface software
[AD-A158599] N86-15954

Operational methods for data interpolation
[DE85-016050] N86-15969

DAASY (data acquisition and analysis system)
[DE85-016341] N86-15971

Data flow graph optimization in IF1
[DE85-007979] N86-15975

DATA PROCESSING EQUIPMENT

Raising the reliability of a remote processing system N86-15928

Organization of processor oriented to multiprocessing N86-15931

DATA PROCESSING TERMINALS

A study of data entry keyboards: The 4 x 4 keypad
[AD-A159095] N86-15926

DATA RECORDERS

Development of a photonic data recorder
[DE85-017120] N86-15655

DATA REDUCTION

A rapid method for estimating equivalent parabolic polars from wind-tunnel tests
[AD-A159559] N86-15251

Application of satellite data to tropic/subtropic moisture coupling N86-15780

DATA SMOOTHING

Rapidly convergent algorithms for nonsmooth optimization
[AD-A159168] N86-16005

Laplacian smoothing splines with generalized cross validation for objective analysis of meteorological data
[AD-A159336] N86-16006

DATA STORAGE

A model of an expert computer vision and recognition facility with applications of a proportion technique
[AD-A158073] N86-15922

DAASY (data acquisition and analysis system)
[DE85-016341] N86-15971

Queueing network systems with unbalanced flows and their applications to performance evaluation of highly parallel distributed information systems: Revision
[AD-A158052] N86-16154

DATA STRUCTURES

On the assignment algorithm by means of multi-linked data structure N86-15426

DATA TRANSMISSION

Procedure for calculating attenuation in and reliability of atmospheric optical data transmission systems N86-15470

Naval space surveillance modernized receiver system. Volume 6: Data communications subsystem
[AD-A158465] N86-15523

A design evaluation checklist for user-system interface software
[AD-A158599] N86-15954

DEATH

Topical hazard evaluation program of Candidate Insect repellent AI3-35770 Hexahydro-1-((2-Methylcyclohexyl) Carbonyl)-1-H-Azepine
[AD-A158386] N86-15903

DECELERATION

Programming a multiple-orifice hydraulic decelerator
[AD-A159428] N86-15328

DECISION MAKING

Light helicopter family trade-off analysis. Volume 4: Appendix N
[AD-A158075] N86-15306

A computer model of case-based reasoning in problem solving: An investigation in the domain of dispute mediation
[AD-A158097] N86-15912

Further informational properties of the Nash and Stackelberg solutions of LQG games
[AD-A158569] N86-15993

DECISIONS

A brief investigation of adaptive decision feedback equalization for digital HF links employing PSK (Phase Shift Keying) modulation
[AD-A157809] N86-15545

DEFECTS

Time dependent rate theory for diffusional defect processes
[ORNL-6122] N86-15355

Ferromagnetic resonance probe liftoff suppression apparatus
[AD-D011913] N86-15647

DLTS (Deep-Level Transient Spectroscopy) analysis of germanium and Al sub x Ga sub 1-x As solar cells
[AD-A159114] N86-15732

Structural and electrical characterization of polycrystalline semiconductor materials
[DE85-012166] N86-16135

DEFENSE PROGRAM

Integrated Services Digital Network (ISDN)
[AD-A159578] N86-15531

DEFLECTION

Large memory acousto-optically addressed pattern recognition
[AD-D011861] N86-16092

DEFORMATION

Flutter generator control and force computer
[AEL-0242-TM] N86-15318

Mechanical properties and deformation behavior of martensite-ferrite dual-phase steels N86-15373

Bulletin of the Faculty of Engineering, Hokkaido University, no. 128
[ISSN-0385-602X] N86-15420

Deformation behavior of anisotropic sand during principal stress axes rotation N86-15421

Effects of waves on the boundary layer of a surface-piercing body
[AD-A158053] N86-15633

Computer simulation of nonequilibrium processes
[DE85-015708] N86-16036

DEGREES OF FREEDOM

Coupled rotor-body vibrations with inplane degrees of freedom N86-15301

DEHUMIDIFICATION

Analysis of a direct radiation solar dehumidification system
[DE85-008820] N86-15736

DELAY

Implementation of a serial delay insertion type loop communication for a real time multitransputer system
[AD-A158980] N86-15960

DELTA WINGS

Numerical solutions for three-dimensional cases: Delta wings N86-15264

DEMULTIPLEXING

Wavelength selective demultiplexer tuner
[AD-D011890] N86-15532

DENSE PLASMAS

Experimental studies of L shell X-ray emission from high density plasmas N86-16095

DENSITY (MASS/VOLUME)

Fundamental studies on the Aluminum-Lithium-Beryllium alloy system
[AD-A158088] N86-15381

Manufacture of dense sintered bodies containing silicon nitride
[NASA-TM-77929] N86-15396

DENSITY DISTRIBUTION

Investigation of large scale structures in a subsonic free jet
[DFVLR-FB-85-38] N86-15644

Investigations of laser initiated discharge channels
[AD-A158872] N86-15660

DEOXYRIBONUCLEIC ACID

Biotechnology and agriculture
[GPO-48-672] N86-15712

Advances in radiobiological research: Hypoxic irradiation effects N86-15894

DEPENDENT VARIABLES

Backlund transformations: Tools to find novel integrable evolution equations
[PREPRINT-443] N86-16009

DEPLOYMENT

The airlift dilemma: An update
[AD-A159307] N86-15353

DEPOSITION

The catalytic activity and selectivity of chemical treated clinoptilolite in the conversion of methanol N86-15424

DEPOSITS

Worldwide deposition of (90)Sr through 1983
[DE85-017599] N86-15741

DEPTH

Description, analysis, and prediction of sea-floor roughness using spectral models
[AD-A158000] N86-15846

Towed thermistor chain observations during MILDEX (Mixed Layer Dynamics Experiment)
[AD-A158304] N86-15847

DESIGN ANALYSIS

Analysis of potential helicopter vibration reduction concepts N86-15302

Optimization of a magnet circuit design for a cylindrical mass spectrometer
[NASA-CR-176400] N86-15543

Design of differential circuit for LSI N-threshold comparator N86-15583

Human factors engineering design criteria for future systems. Report number 3: Design criteria evolving from the Multiple Multiple Rocket System (MLRS) operational test 3
[AD-A158316] N86-15916

Problems of devloping algorithmic design system N86-15939

Implementation of a serial delay insertion type loop communication for a real time multitransputer system
[AD-A158980] N86-15960

Expert systems in engineering practice
[ISBN-90-6818-018-5] N86-15977

TOM: A program for interactive lattice design
[DE85-016988] N86-16077

Computational needs for modelling accelerator components
[DE85-015262] N86-16082

Research for thermal behavior of liquid-metal wall in ICF reactor N86-16111

DESORPTION
Collection and analysis of NASA clean room air samples
[NASA-CR-3947] N86-15358
The application of diffusion theory to the analysis of hydrogen desorption data at 25 deg C
[NASA-TM-86531] N86-15359
DETECTION
Number of targets threatened simultaneously (NOTTS) in conjunction with over the horizon back-scatter (OTHB) radar coverage
[AD-A159304] N86-15528
A comparison of LANDSAT TM to MSS imagery for detecting submerged aquatic vegetation in lower Chesapeake Bay N86-15707
Severe storm detection with passive 37 Ghz observations N86-15797
DETONATION
A buffer diverter system
[AD-D011902] N86-15559
Color post-processor for the EPIC-2 computer program
[AD-A159321] N86-15961
DETONATORS
Miniature plasma accelerating detonator and method of detonating insensitive materials
[DE85-017747] N86-15418
DIELECTRIC PROPERTIES
Contribution to multilayer spherical screen theory N86-15571
Research on the crystal growth and dielectric properties of high permittivity ferroelectric materials
[AD-A157820] N86-16126
DIELECTRICS
Extension of electronic transport properties of polymer dielectrics to severe environments encountered in systems
[DE85-017321] N86-15406
Excitation of array of plane-parallel waveguides covered with dielectric layer of finite length N86-15459
Multilayer volume microwave filters N86-15465
Investigations and comparisons of new types of millimetre-wave planar arrays using microstrip and dielectric structures
[AD-A158313] N86-15522
Electrical characteristics of Si devices fabricated with completely consumed carbide (C3) dielectric isolation process
[AD-A158296] N86-15547
Completely consumed carbide (C3) - A new process for dielectric isolation
[AD-A158298] N86-15548
Measuring radiation electroconductivity of solid dielectrics exposed to pulsed ionizing radiation N86-15604
DIESEL ENGINES
Preliminary study on the control of a direct injection diesel engine for better fuel flexibility and emissions control, parts 1 and 2
[TRITA-REG-8501] N86-15673
A computer simulation of the turbocharged turbo compounded diesel engine system: A description of the thermodynamic and heat transfer models
[NASA-CR-174971] N86-16164
DIFFERENCE EQUATIONS
A consistent spatial differencing scheme for the transonic full-potential equation in three dimensions
[NASA-TM-86716] N86-15246
DIFFERENTIAL AMPLIFIERS
Frequency characteristics of differential optron N86-15497
DIFFERENTIAL EQUATIONS
The flapping movement and frequency of rotating windmill wings defined with a differential equation
[IW-R501] N86-15255
The influence of dynamic inflow and torsional flexibility on rotor damping in forward flight from symbolically generated equations N86-15295
Mathematical modeling of main lightning stage N86-15503
A computer model of driver response
[UTIAS-293] N86-15911
Control and identification of time varying systems
[AD-A159067] N86-15999
Some solvable dynamical systems
[PREPRINT-441] N86-16008
DIFFERENTIAL INTERFEROMETRY
Vortices and pressure waves at trailing edges
[ISL-CO-224/84] N86-15252
DIFFRACTION PATTERNS
Standard X-ray diffraction powder patterns
[NBS/MN-25-SEC-21] N86-15357
Observation of microwave Cerenkov radiation as diffraction pattern
[AD-A159337] N86-16057
Wavelength error analysis in a multiple-beam Fizeau laser wavemeter having a linear diode array readout
[NASA-TM-87614] N86-16089
DIFFRACTOMETERS
Standard X-ray diffraction powder patterns
[NBS/MN-25-SEC-21] N86-15357
DIFFUSION
Configurational diffusion in semidilute solutions
[DE85-017121] N86-15405
Hydrogen diffusion, positron annihilation in 40CrNiMo steel N86-15439
Mathematical problems in stability, control and reliability of random access communication systems
[AD-A159402] N86-15529
PETROS: A progam for calculating transport of heat, water, water vapor and air through a porous material
[DE85-013168] N86-15972
Nonlinear diffusion equations
[AD-A158305] N86-15992
DIFFUSION THEORY
The application of diffusion theory to the analysis of hydrogen desorption data at 25 deg C
[NASA-TM-86531] N86-15359
DIGESTIVE SYSTEM
Investigations of the effects of gravity on Paramecium caudatum structure and behavior
[DFVLR-FB-85-40] N86-15863
DIGITAL COMPUTERS
Variable radix processor
[AD-D011893] N86-15918
Work on putting computer and CRTs in airliner control panels N86-15947
An interactive discrete controls analysis option (ORACLS) for the CONTROLS analysis package on the IBM 3033
[AD-A158754] N86-15956
DIGITAL DATA
Systematic and random variations in digital Thematic Mapper data
[E86-10018] N86-15711
DIGITAL SIMULATION
Using digital simulation in the design of CAMAC systems N86-15934
DIGITAL SYSTEMS
PIFCGT: A PIF autopilot design program for general aviation aircraft
[NASA-CR-166123] N86-15320
Digital servocontroller system. Volume 2. Maintenance manual
[AD-A159066] N86-15322
Selection of signals for digital optical channel N86-15471
Integrated Services Digital Network (ISDN)
[AD-A159578] N86-15531
Bipolar digitizer having compression capability
[AD-D011895] N86-15542
Demonstrate capabilities of digital graphics system to obtain quantitative information from flow visualization data
[AD-A158760] N86-15923
Wide-band single-board analog-digital converter N86-15935
DIGITAL TELEVISION
Digital television routing systems: An introduction to integrated optical waveguide techniques and devices
[BBC-RD-1985/9] N86-15515
Digital methods of recording color television images on film tape N86-15579
DIGITAL TO ANALOG CONVERTERS
Wide-band single-board analog-digital converter N86-15935
DIMENSIONS
Method of calculating angular dimensions of flight vehicle cockpit canopy casings N86-15886
DIODES
Characteristics of electrophysical and photoelectric properties of MOS-structures on indium arsenide N86-15486
A two-terminal microelectrochemical diode with contact spacing of about one micron. A device based on one solution redox couple and one electrode-confined redox couple
[AD-A158774] N86-15553
Intrinsic magnetic field of electron beam N86-15590
Two-step pulse triggering of dynistor power switches N86-15601
Procedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams
[IPPJ-742] N86-16096
Investigation of diode physics using an annular magnetically insulated ion diode operated in long pulse mode N86-16097
Experiments on cryogenic pulsed ion sources N86-16098
Magnetic insulation in an ion diode with toroidal magnetic field N86-16099
Pulse power transport to REB diode through slender MITL N86-16100
Geometric compression of hollow cylinder in a coaxial relativistic electron beam diode N86-16101
Characteristics of intense pulsed ion beam extracted from dual-current-feed magnetically-insulated diode N86-16103
Time-resolved measurement of energy and species of an intense pulsed ion beam N86-16104
Simulation of ion-beam in MID N86-16107
DIPOLE ANTENNAS
Synthesis of log-periodic antennas with prescribed geometry N86-15454
Use of active quenching for reduction of power dissipation in dipole antenna array N86-15460
Effect of corner reflector on field of linear radiator N86-15462
DIRECT CURRENT
Redox capacity and dc electron conductivity in electroactive materials
[AD-A159431] N86-15401
Principles and problems of building dc electric drives with symistor control N86-15598
Internal conditions for self excitation of superconductor DC generators N86-15606
Maximum attainable sensitivity of dc squids built with Josephson tunnel junctions N86-15619
DIRECTIVITY
Absolute measurements of antenna parameters by illumination method N86-15511
DISCHARGERS
Self-quenching streamer discharge characteristics at extreme gas compositions N86-15442
DISCONTINUITY
Studies on the interference of wings and propeller slipstreams N86-15241
Problems of devloping algorithmic design system N86-15939
DISCRETE FUNCTIONS
The broadband normal mode model PROTEUS
[AD-A159091] N86-16048
DISCRIMINATION
Estimating number and parameters of signal components in presence of noise N86-15567
DISLOCATIONS (MATERIALS)
Analysis of dislocation kinetics across shocks
[DE85-016444] N86-15638
DISPERSING
Demonstrate capabilities of digital graphics system to obtain quantitative information from flow visualization data
[AD-A158760] N86-15923
DISPLAY DEVICES
East Europe report: Science and technology
[JPRS-ESA-85-033] N86-15473
GDR scientists develop electroluminescence display N86-15476
Visual display parameters
[AD-A158773] N86-15654
A design study for a three-dimensional display computer terminal for meteorological information N86-15816
Program base for raster display N86-15937
Work on putting computer and CRTs in airliner control panels N86-15947
A design evaluation checklist for user-system interface software
[AD-A158599] N86-15954
EPIC/JANUS user's guide
[DE85-017027] N86-16158
DISSOCIATION
Catalytic surface effects on contaminated space shuttle tile in a dissociated nitrogen stream
[NASA-TM-86770] N86-15335
Molecular processes in a high temperature shock layer
[NASA-CR-176357] N86-16054
DISTANCE
Random sequential coding by hamming distance
[AD-A158003] N86-15989
DISTORTION
Investigation of hologram analyzer with single-component optical hologram matching system N86-15507
DISTRIBUTED PARAMETER SYSTEMS
Nonlinear control of distributed parameter systems
[INPE-3623-PRE/807] N86-15986
Control of nonlinear distributed parameter systems
[INPE-3624-PRE/808] N86-15987
DISTRIBUTED PROCESSING
The ISIS project: R and D status and technical report
[AD-A158930] N86-15959

Queueing network systems with unbalanced flows and their applications to performance evaluation of highly parallel distributed information systems: Revision [AD-A158052] N86-16154

DISTRIBUTION (PROPERTY)
Methods of equalizing electric fields in high-voltage devices N86-15587

DISTRIBUTION FUNCTIONS
Non-uniform bounds of normal approximation for finite-population U-statistics [AD-A159163] N86-16003

DISTRIBUTORS
Modular distributor for controlling group of electric drives N86-15599

DIURETICS
Effect of dry immersion model on parameters of fluid-electrolyte metabolism, blood plasma aldosterone and cortisol levels in individuals differing in body fluid content N86-15875

DIURNAL VARIATIONS
Optical characteristics of lightning and thunderstorm currents N86-15788

DIVERGENCE
Mesoscale: Cloud scale simulation of convective response N86-15802

DIVERTERS
A buffer diverter system [AD-D011902] N86-15559

DIVING (UNDERWATER)
Some aspects of determining human physical work capacity under hyperbaric conditions N86-15867

DOMES (STRUCTURAL FORMS)
Visual display parameters [AD-A158773] N86-15654

DOPED CRYSTALS
Investigation of reverse branch of voltage-current curve of GaAs high-voltage p-n structure N86-15614

DOPPLER RADAR
Mobile intercept of storms N86-15771
Multiscale modeling to evaluate proposed space-based Doppler lidar sampling strategies N86-15774
Analysis of Doppler lidar data N86-15792
Airborne Doppler lidar activities N86-15793
Analysis of satellite data for sensor improvement (detection of severe storms from space) N86-15796
Doppler wind profile experiment N86-15818

DOWNWASH
Light helicopter family trade-off analysis. Volume 10: Appendices V, W, X, and Z [AD-A158079] N86-15309

DRAG MEASUREMENT
Prediction of the drag of wings at subsonic speeds by viscous/inviscid interaction techniques N86-15274

DRAG REDUCTION
Aircraft Drag Prediction and Reduction [AGARD-R-723] N86-15266
Aircraft drag reduction technology: A summary N86-15267
Laminar flow control with suction: Theory and experiment N86-15269
Design considerations for application of laminar flow control systems to transport aircraft N86-15270
Turbulent drag reduction for external flows N86-15271
Parasitic and interference drag prediction and reduction N86-15272
Recent developments in three-dimensional wake analysis N86-15273
Transonic drag rise and drag reduction by active/passive boundary layer control N86-15275

DRIFT (INSTRUMENTATION)
Degradation of surface-acoustic-wave resonators N86-15573

DROP SIZE
Droplet sizing research [AD-A158318] N86-15653

DROPS (LIQUIDS)
Droplet size and evaporation rate within a two-phase flow by morphology-dependent resonances in the optical spectra [AD-A158931] N86-16091

DROUGHT
Large-scale circulation anomalies and the predictability of northeast Brazil droughts [INPE-3656-PRE/819] N86-15768

DRUGS
East Europe report: Science and technology [JPRS-ESA-85-037] N86-15408
Anti-trypanosomal activity of platinum coordination compounds [AD-D011860] N86-15897

DRYING
Effect of dry immersion model on parameters of fluid-electrolyte metabolism, blood plasma aldosterone and cortisol levels in individuals differing in body fluid content N86-15875

DUCTILITY
Mechanical properties and deformation behavior of martensite-ferrite dual-phase steels N86-15373

DURABILITY
Studies of molecular properties of polymeric materials: Aerospace environmental effects on three linear polymers [NASA-TM-87532] N86-15391
Studies of molecular properties of polymeric materials: Aerospace environmental effects on three linear polymers (polymer durability) N86-15392
Radio-frequency electrical properties of some neat and metal-doped polyimides N86-15393

DYES
Demonstrate capabilities of digital graphics system to obtain quantitative information from flow visualization data [AD-A158760] N86-15923

DYNAMIC CHARACTERISTICS
Dynamic characteristics of air data sensor systems: Altimeter, speedometer and alpha times beta vane [NAL-TR-852] N86-15312
Effects of vibration-induced cavitation of physicochemical characteristics of aircraft fuel N86-15346
Characteristics of electrophysical and photoelectric properties of MOS-structures on indium arsenide N86-15486
Methodology for determining dynamic characteristics of tristable-logic integrated circuits N86-15491
Dynamic gas temperature measurement system. Volume 2: Operation and program manual [NASA-CR-168267] N86-15651
Towed thermistor chain observations during MILDEX (Mixed Layer Dynamics Experiment) [AD-A158304] N86-15847
Dynamic monotone priorities on planar sets (extended abstract) [AD-A158610] N86-15955

DYNAMIC MODELS
Test results from a dynamic model dynaflex rotor N86-15285
Development of an unsteady aerodynamics model to improve correlation of computed blade stresses with test data N86-15288
Dynamic characteristics of air data sensor systems: Altimeter, speedometer and alpha times beta vane [NAL-TR-852] N86-15312
Preliminary study on the control of a direct injection diesel engine for better fuel flexibility and emissions control, parts 1 and 2 [TRITA-REG-8501] N86-15673

DYNAMIC PROGRAMMING
Multiprocessor systems with dynamic redistribution of requests through a common bus N86-15933

DYNAMIC RESPONSE
A review of dynamic inflow and its effect on experimental correlations N86-15293
Dynamic response characteristics of a circulation control rotor model pneumatic system N86-15298
Dynamic response of film thickness in spiral-groove face seals [NASA-TP-2544] N86-15313
The dynamic response of discretely damped structures under harmonic and random excitation [R-475] N86-15686
A computer model of driver response [UTIAS-293] N86-15911

DYNAMIC STABILITY
A review of dynamic inflow and its effect on experimental correlations N86-15293
The dynamic response of discretely damped structures under harmonic and random excitation [R-475] N86-15686

DYNAMIC STRUCTURAL ANALYSIS
An analysis of cross-coupling of a multicomponent jet engine test stand using finite element modeling techniques [NASA-CR-176424] N86-15323

DYNAMICAL SYSTEMS
Automated mesoscale winds derived from GOES multispectral imagery N86-15798
Some solvable dynamical systems [PREPRINT-441] N86-16008
Connectance and equipartition thresholds in hamiltonian systems [PREPRINT-445] N86-16010

E

E REGION
Project HERO: Heating Rocket Experiments. The H and E field probe (HESO): In situ measurements of plasma parameters in the ionospheric plasma modified by electromagnetic waves of high intensity [BMFT-FB-W-85-009] N86-15766

EARTH (PLANET)
Seismic moment tensor recovery at low frequencies N86-15750
Precessions of the Earth and the Bohr atom [DE85-015612] N86-16171

EARTH ATMOSPHERE
Capabilities, needs and applications of gaseous tracers [DE85-015194] N86-15743
Micro-Raman spectroscopy: The analysis of micrometer and submicrometer atmospheric aerosols [NASA-CR-177964] N86-15756
The Earth's atmosphere: Ideas old and new [AD-A159558] N86-15828

EARTH CORE
Technological applications of Earth core research [AD-A158991] N86-15759

EARTH CRUST
The seismicity of southern Sweden, 1979 - 1984 [FOA-C-20572-TI] N86-15765

EARTH SURFACE
Recommendations for developing simulators of solar radiation penetrating to the Earth's surface N86-15603

EARTHQUAKES
Geophysical Bulletin of Hokkaido University, no. 46 [ISSN-0439-3503] N86-15695
A study of the strong ground motion of the western Hidaka, Hokkaido earthquake N86-15701
Seismic intensity survey and hypocenter recalculation on the 1985 Sapporo earthquake (M 3.5) N86-15702
The seismicity of southern Sweden, 1979 - 1984 [FOA-C-20572-TI] N86-15765

ECHOES
Informativeness of echo signal in pulsed ultrasonography of the brain (with use of model) N86-15887

ECONOMIC ANALYSIS
Belorussian computer speaks, reads graphics, X-rays N86-15945

ECONOMICS
System engineering and energy cost analysis of small and medium wind turbines [DE85-012159] N86-15738

ECOSYSTEMS
Biochemical processes in sagebrush ecosystems: Interactions with terrain [E86-10015] N86-15705

EDITING ROUTINES (COMPUTERS)
Red-graphic editor in printed circuit board design system N86-15942
Running ROSS in an Emacs environment [AD-A159567] N86-15966

EDUCATION
Image registration N86-15718
East Europe report: Science and technology [JPRS-ESA-85-031] N86-15893
A comparison of the effects of circuit weight training on men and women [AD-A159419] N86-15910
National Science Foundation authorization, 1986 [GPO-46-945] N86-16162

EFFICIENCY
Development of packed-tower air strippers for trichloroethylene removal at Wurtsmith Air Force Base, Michigan [AD-A159139] N86-15326
Ultimate limits of FT-IR [DE85-016442] N86-15652
System engineering and energy cost analysis of small and medium wind turbines [DE85-012159] N86-15738
Laser produced plasma affects on welding [DE85-009638] N86-16118
Field test of the methodology for generating efficiency and effectiveness measures [AD-A158183] N86-16149

EGYPT
Geology, petrology, and geochemistry of a younger granite pluton, central Eastern Desert of Egypt; importance of mixing N86-15746

EIGENVALUES
Algorithms and software for pole assignment and observers, revision 1 [DE85-016068] N86-15970
Strong representation of weak convergence [AD-A159078] N86-16000

EIGENVECTORS
Analysis of elliptical waveguides in cylindrical reference basis N86-15612
EJECTION SEATS
Three-axis electrofluidic angular rate sensor for ejection seat steering thrust vector control
[AD-A159413] N86-15277
ELASTIC MEDIA
The Dowling wall pressure-spectrum analogy applied to an isotropic two-layered elastic medium
[AD-A158009] N86-15632
ELASTIC PROPERTIES
Hydrodynamic noise and surface compliance--an overview of the Naval Underwater Systems Center IR/IED program
[AD-A157799] N86-15630
Elastic bearing
[AD-A159140] N86-15672
ELASTIC WAVES
Vortices and pressure waves at trailing edges
[ISL-CO-224/84] N86-15252
Nondestructive ultrasonic characterization of engineering materials
[NASA-CR-176349] N86-15680
ELASTOHYDRODYNAMICS
Elastohydrodynamic studies using thin film transducers
[RP-666] N86-15648
Static and dynamic material model for elastohydrodynamic bearing calculations
[IWECO-5076503] N86-15676
ELASTOMERS
USSR report: Chemistry
[JPRS-UCH-85-013] N86-15344
The effect of environmental stress on Sylgard 170 silicone elastomer
[TI85-013268] N86-15407
ELECTRIC CONDUCTORS
Reflection coefficient of harrow grating with conductor strips with respect to electromagnetic waves N86-15577
ELECTRIC CURRENT
Dependence of electric current through human body on parameters of 3-0 network in range of high insulation admittance N86-15588
Faster-than-light sources in electron beams N86-15593
Research and development of an aimed magnetic lead current density-magnetic field diagnostic
[DE85-014720] N86-16060
ELECTRIC DISCHARGES
Mathematical modeling of main lightning stage N86-15503
Investigations of laser initiated discharge channels
[AD-A158872] N86-15660
ELECTRIC FIELD STRENGTH
Intrinsic magnetic field of electron beam N86-15590
ELECTRIC FIELDS
Local ionospheric irregularity effect on ELF radiowave propagation N86-15569
Methods of equalizing electric fields in high-voltage devices N86-15587
Influence of embedded electrical fields on temperature stability of parameters of I-Ga-As heterophotoelements N86-15615
Mobile intercept of storms N86-15771
Magnetic insulation in an ion diode with toroidal magnetic field N86-16099
Research on the crystal growth and dielectric properties of high permittivity ferroelectric materials
[AD-A157820] N86-16126
ELECTRIC FILTERS
Input current shaped ac-to-dc converters
[NASA-CR-176438] N86-15544
ELECTRIC GENERATORS
Internal conditions for self excitation of superconductor DC generators N86-15606
ELECTRIC MOTORS
Active magnetic suspension in main magnetic field of electric motor N86-15502
Principles and problems of building dc electric drives with symistor control N86-15598
Modular distributor for controlling group of electric drives N86-15599
Electric drive motors for industrial robots N86-15600
ELECTRIC POTENTIAL
Analysis of transients in direct current cable insulation N86-15468
Bipolar digitizer having compression capability
[AD-D011895] N86-15542
Stochastic differential equations for neuronal behavior
[AD-A159099] N86-15908
The detection of faint space object with solid state image detectors
[AD-A158594] N86-16166
ELECTRIC POWER SUPPLIES
Proposal of power plant by LIB fusion N86-16113
ELECTRIC PULSES
Pulse-type voltage stabilizer with integral pulse-width modulation N86-15505
ELECTRIC SWITCHES
Picosecond photoconductivity of indium aresenide N86-15596
ELECTRICAL ENGINEERING
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-009] N86-15452
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-011] N86-15484
ELECTRICAL INSULATION
Analysis of transients in direct current cable insulation N86-15468
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-006] N86-15561
Methods of equalizing electric fields in high-voltage devices N86-15587
Dependence of electric current through human body on parameters of 3-0 network in range of high insulation admittance N86-15588
Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams
[IPPJ-742] N86-16096
Characteristics of intense pulsed ion beam extracted from dual-current-feed magnetically-insulated diode N86-16103
ELECTRICAL MEASUREMENT
Methodology for determining dynamic characteristics of tristable-logic integrated circuits N86-15491
ELECTRICAL PROPERTIES
Microstructures built from electroactive polymers: Toward a macromolecular electronics
[AD-A159430] N86-15400
Moldable electrically conductive polymer compositions
[AD-D011887] N86-15402
Electrical characteristics of Si devices fabricated with completely consumed carbide (C3) dielectric isolation process
[AD-A158296] N86-15547
Completely consumed carbide (C3) - A new process for dielectric isolation
[AD-A158298] N86-15548
ELECTRICAL RESISTANCE
Pulse-type voltage stabilizer with integral pulse-width modulation N86-15505
ELECTRICAL RESISTIVITY
Evaluating structural changes in jet fuels by electrical conductivity and viscosity N86-15345
Energy function and conductivity of metal-polymer composites N86-15347
Moldable electrically conductive polymer compositions
[AD-D011887] N86-15402
Surface passivation of semiconductor circuit elements with layer of wideband semiconductor N86-15485
Measuring radiation electroconductivity of solid dielectrics exposed to pulsed ionizing radiation N86-15604
Monitoring of hot water plume movements in an aquifer with borehole/surface resistivity measurements
[DE85-014531] N86-15637
The CTD data from the Northeast Atlantic 22 N-33 N, 19 W-24 W, July 1983. Discovery cruises 138, 139. --- conductivity, temperature, depth (CTD)
[IOS-188] N86-15850
CTD data from the Northeast Atlantic Ocean 40-48 N, 12-21 W collected on RRS DISCOVERY cruise 132 in February 1983 --- conductivity, temperature, depth (CTD)
[IOS-192] N86-15851
Electron reactions in model and biological systems
[DE85-016062] N86-15861
ELECTRO-OPTICS
GDR scientists develop electroluminescence display N86-15476
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-011] N86-15484
Apparatus for experimental study of high-resolution radiometers and their characteristics N86-15496
Frequency characteristics of differential optron N86-15497
Wavelength selective demultiplexer tuner
[AD-D011890] N86-15532
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-006] N86-15561
Analysis of Doppler lidar data N86-15792
East Europe report: Science and technology
[JPRS-ESA-85-031] N86-15893
Advances in optoelectronic, nuclear reactor, radiobiological research: High voltage optocoupler N86-15896
Integrated optoelectronic circuits utilizing InGaAsP grown by molecular beam epitaxy
[AD-A159403] N86-16129
ELECTROACOUSTIC TRANSDUCERS
Nonsinusoidal modes of oscillator with multifrequency surface-acoustic-wave resonator N86-15488
ELECTROACOUSTIC WAVES
Project HERO: Heating Rocket Experiments. The H and E field probe (HESO): In situ measurements of plasma parameters in the ionospheric plasma modified by electromagnetic waves of high intensity
[BMFT-FB-W-85-009] N86-15766
ELECTROCHEMICAL OXIDATION
Microstructures built from electroactive polymers: Toward a macromolecular electronics
[AD-A159430] N86-15400
Selective anodic oxidation of semiconductors for pattern generation
[AD-D011889] N86-16133
ELECTROCHEMISTRY
USSR report: Chemistry
[JPRS-UCH-85-013] N86-15344
Electrochemical gas sensors and gas analysis equipment
[DRIC-T-7521] N86-15354
The application of diffusion theory to the analysis of hydrogen desorption data at 25 deg C
[NASA-TM-86531] N86-15359
Redox capacity and dc electron conductivity in electroactive materials
[AD-A159431] N86-15401
A two-terminal microelectrochemical diode with contact spacing of about one micron. A device based on one solution redox couple and one electrode-confined redox couple
[AD-A158774] N86-15553
Micron-spaced platinum interdigitated array electrode: Fabrication, theory and initial use
[AD-A159429] N86-15556
ELECTRODES
Microstructural control to improve the properties of chromium-molybdenum weld metal
[DE85-016179] N86-15390
Microstructures built from electroactive polymers: Toward a macromolecular electronics
[AD-A159430] N86-15400
Miniature plasma accelerating detonator and method of detonating insensitive materials
[DE85-017747] N86-15418
A two-terminal microelectrochemical diode with contact spacing of about one micron. A device based on one solution redox couple and one electrode-confined redox couple
[AD-A158774] N86-15553
Micron-spaced platinum interdigitated array electrode: Fabrication, theory and initial use
[AD-A159429] N86-15556
Degradation of surface-acoustic-wave resonators N86-15573
Tubular strong-current relativistic electron beam instability N86-15592
Geometric compression of hollow cylinder in a coaxial relativistic electron beam diode N86-16101
ELECTRODYNAMICS
Thin-film bolometer power transduce electrodynamic analysis and experimental investigation N86-15609
Analysis of elliptical waveguides in cylindrical reference basis N86-15612
ELECTROLUMINESCENCE
East Europe report: Science and technology
[JPRS-ESA-85-033] N86-15473
GDR scientists develop electroluminescence display N86-15476
ELECTROLYSIS
Electrolysis of CO(2) by novel metallopolymeric cathodes
[AD-A158228] N86-15364
ELECTROLYTE METABOLISM
Effect of dry immersion model on parameters of fluid-electrolyte metabolism, blood plasma aldosterone and cortisol levels in individuals differing in body fluid content N86-15875
ELECTROLYTES
Experimental investigation of acoustic wave electrical excitation in electrolyte solution N86-15621
Beta alumina: A solid-electrolyte as a solid-state laser host
[AD-A159409] N86-15864
Investigation of possibility of using two-frequency impedometry for estimation of proportion of total and extracellular body fluids N86-15888
ELECTROMAGNETIC ABSORPTION
Laser intracavity absorption as a plasma diagnostic aid
[DE85-015741] N86-16120
ELECTROMAGNETIC COMPATIBILITY
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-011] N86-15484

USSR report: Electronics and electrical engineering [JPRS-UEE-85-006] N86-15561

ELECTROMAGNETIC FIELDS

Maximum antenna power reception in lossy medium N86-15563

Determination of point source image field structure by real radiooptical antenna N86-15564

Solution of the field equations for 2-D electromagnetic direct implicit plasma simulation [DE85-016073] N86-16123

ELECTROMAGNETIC INTERFERENCE

Advances in optoelectronic, nuclear reactor, radiobiological research: High voltage optocoupler N86-15896

ELECTROMAGNETIC MEASUREMENT

Determination of electromagnetic forces in magnetic field calculations N86-15504

ELECTROMAGNETIC NOISE

Systematic and random variations in digital Thematic Mapper data [E86-10018] N86-15711

ELECTROMAGNETIC PROPERTIES

Determination of electromagnetic forces in magnetic field calculations N86-15504

ELECTROMAGNETIC PULSES

Theoretical studies of two-dimensional effects in free electron lasers [AD-A158229] N86-15659

Pulsed septum magnet for the Fermilab antiproton source [DE85-016993] N86-16078

ELECTROMAGNETIC RADIATION

Activities report of the Radio Laboratory [REPT-S-160] N86-15534

Modulation instability and solitons of electromagnetic wave envelopes in ferromagnetic semiconductors N86-15578

Faster-than-light sources in electron beams N86-15593

Single station assessment of atmospheric boundary layer properties in the eastern Mediterranean Sea [AD-A159432] N86-15827

ELECTROMAGNETIC SHIELDING

Contribution to multilayer spherical screen theory N86-15571

ELECTROMAGNETIC WAVE FILTERS

Sieves and a filter for Gaussian processes [AD-A158762] N86-15994

ELECTROMAGNETIC WAVE TRANSMISSION

Contribution to multilayer spherical screen theory N86-15571

ELECTROMAGNETISM

Activities report of the Radio Laboratory [REPT-S-160] N86-15534

ELECTROMECHANICAL DEVICES

Electrolysis of CO(2) by novel metallopolymeric cathodes [AD-A158228] N86-15364

Raising the reliability of a remote processing system N86-15928

ELECTRON ACCELERATORS

Accelerator timing system [LINO-109] N86-15560

Collective accelerator for electron colliders [DE85-012878] N86-16059

Computational needs for modelling accelerator components [DE85-015262] N86-16082

ELECTRON AVALANCHE

Delay effect in pulsed avalanche discharge of an XeCl laser at high gas pressure N86-15482

ELECTRON BEAMS

Experiments in long-wavelength communication using modulated electron beam antennas: A parameter study [AD-A157810] N86-15519

Faster-than-light sources in electron beams N86-15593

Research on intense electron beams and applications [AD-A158234] N86-16055

Collective accelerator for electron colliders [DE85-012878] N86-16059

Intense e-beam interaction with matter [DE85-017093] N86-16063

IFA-2 collective ion accelerator experiments [DE85-012358] N86-16067

Computational needs for modelling accelerator components [DE85-015262] N86-16082

Generation of ion beams in plasma focus N86-16102

Operation at high voltage and power brightness of ion beam on conical pinched electron beam diode N86-16105

Nonlinear analysis of a relativistic beam-plasma cyclotron instability [AD-A159159] N86-16115

ELECTRON BUNCHING

Collective accelerator for electron colliders [DE85-012878] N86-16059

ELECTRON DENSITY (CONCENTRATION)

Intrinsic magnetic field of electron beam N86-15590

Overlap of electron core states for very high compressions [DE85-015745] N86-16138

ELECTRON DIFFUSION

Redox capacity and dc electron conductivity in electroactive materials [AD-A159431] N86-15401

ELECTRON EMISSION

Energy function and conductivity of metal-polymer composites N86-15347

Textured carbon on copper: A novel surface with extremely low secondary electron emission characteristics [NASA-TP-2543] N86-15394

Multi-color X-ray line source [AD-D011910] N86-16088

ELECTRON ENERGY

Structural transformations in semiconductors during optical pumping N86-15490

ELECTRON GUNS

Experiments in long-wavelength communication using modulated electron beam antennas: A parameter study [AD-A157810] N86-15519

ELECTRON MICROSCOPY

Fundamental studies and device development in beta silicon carbide [AD-A159446] N86-16132

ELECTRON MOBILITY

Submicron phonics 1 [AD-A159421] N86-16131

ELECTRON ORBITALS

Structural transformations in semiconductors during optical pumping N86-15490

ELECTRON OSCILLATIONS

China reaches new level in minicomputer development N86-15440

ELECTRON PLASMA

Geometric compression of hollow cylinder in a coaxial relativistic electron beam diode N86-16101

ELECTRON RECOMBINATION

Molecular processes in a high temperature shock layer [NASA-CR-176357] N86-16054

ELECTRON STATES

Overlap of electron core states for very high compressions [DE85-015745] N86-16138

ELECTRON TRAJECTORIES

China reaches new level in minicomputer development N86-15440

ELECTRON TRANSFER

Redox capacity and dc electron conductivity in electroactive materials [AD-A159431] N86-15401

Application of electron-transfer theory to several systems of biological interest [DE85-015835] N86-15860

Electron reactions in model and biological systems [DE85-016062] N86-15861

ELECTRON TRANSITIONS

Metal-insulator transition and Landau Fermi liquid theory [NOTA-INTERNA-844] N86-16142

ELECTRONIC CONTROL

Preliminary study on the control of a direct injection diesel engine for better fuel flexibility and emissions control, parts 1 and 2 [TRITA-REG-8501] N86-15673

ELECTRONIC EQUIPMENT

USSR report: Electronics and electrical engineering [JPRS-UEE-85-011] N86-15484

ELECTRONIC EQUIPMENT TESTS

Measurement of radiation intensity on the IEA SSPS/CRS solar tower plant in Spain [DFVLR-FB-85-36] N86-15739

Raising the reliability of a remote processing system N86-15928

ELECTRONIC TRANSDUCERS

The Surface Acoustic Wave (SAW) chemisensor. Part 1: A literature review [PML-1985-3-PT-1] N86-15649

ELECTRONIC WARFARE

Considerations for the design and implementation of a management support system for the Electronic Warfare System Support Laboratory [AD-A158978] N86-15325

ELECTRONICS

China report: Science and technology [JPRS-CST-85-038] N86-15438

USSR report: Electronics and electrical engineering [JPRS-UEE-85-009] N86-15452

ELECTRONS

Self-consistent electronic structure of alpha-phase Hume-Rothery electron compound [DE85-017560] N86-16080

Submicron phonics 1 [AD-A159421] N86-16131

Overlap of electron core states for very high compressions [DE85-015745] N86-16138

ELECTROPHYSICS

Characteristics of electrophysical and photoelectric properties of MOS-structures on indium arsenide N85-15486

ELLIPSES

Analysis of elliptical waveguides in cylindrical reference basis N86-15612

Adaptive grid generation using elliptic generating equations with precise coordinate controls [AD-A159158] N86-16002

ELLIPTIC DIFFERENTIAL EQUATIONS

Nonlinear diffusion equations [AD-A158305] N86-15992

EMERGENCIES

One aspect of crew training N86-15885

Use of chemical explosives for emergency solar flare shelter construction and other excavations on the Martian surface [DE85-014131] N86-16176

EMISSION

Stimulated emission of bounded strong-current electron beam with longitudinal magnetic field magnetostatic pumping N86-15591

EMISSION SPECTRA

Spectroscopic studies of detonating heterogeneous explosives [DE85-007687] N86-15419

Multi-color X-ray line source [AD-D011910] N86-16088

Experimental studies of L shell X-ray emission from high density plasmas N86-16095

Emission region of gamma ray bursts [DE85-013198] N86-16183

EMITTERS

Micro-power dissipation device described N86-15441

EMPLOYEE RELATIONS

Implementation of multifunction information systems at three Navy facilities [AD-A157797] N86-16153

ENAMELS

East Europe report: Science and technology [JPRS-ESA-85-037] N86-15408

Thermally, chemically resistant enamels N86-15409

ENERGETIC PARTICLES

Mechanisms of excitation and ionization processes in sputtering [AD-A158061] N86-15361

ENERGY CONVERSION

Demonstration of a pyroelectric conversion power cycle with a polymer [AD-A158964] N86-15398

Assessment of dynamic energy conversion systems for radioisotope heat sources [DE85-016202] N86-15737

ENERGY DISSIPATION

Micro-power dissipation device described N86-15441

Procedure for calculating attenuation in and reliability of atmospheric optical data transmission systems N86-15470

ENERGY DISTRIBUTION

Airborne atmospheric electricity experiments N86-15790

ENERGY GAPS (SOLID STATE)

Structural transformations in semiconductors during optical pumping N86-15490

Properties of optical filters on CdSe-HgSe base N86-15506

Monolithic cascade-type solar cells [NASA-TM-77926] N86-15731

ENERGY POLICY

LANDSAT TM image data quality analysis for energy-related applications [E86-10009] N86-15703

ENERGY SPECTRA

Properties of optical filters on CdSe-HgSe base N86-15506

165-kW open-cycle OTEC experiment [DE85-008818] N86-15735

ENERGY STORAGE

Advanced Integrated Power and Attitude Control System (IPACS) study [NASA-CR-3912] N86-15338

ENERGY TRANSFER

In search of high J states in the HF(v, J) system [AD-A158937] N86-16073

ENGINE DESIGN
Review of the development of small- and medium-capacity gas turbines at the Motoren- und Turbinen Union
[NASA-TM-77942] N86-15314
ENGINE FAILURE
Aircraft accident report: Vieques Air Link, Inc., Britten-Norman BN-21-6 Islander, N589SA, Vieques, Puerto Rico, August 2, 1984
[PB85-901408] N86-15276
Resonant cavities for stall recovery in gas turbine engines
[AD-D011891] N86-15317
ENGINE TESTS
Techniques for fatigue life predictions from measured strains
[NASA-CR-178574] N86-15688
ENGINEERING DRAWINGS
Mod-5A wind turbine generator program design report. Volume 2: Conceptual and preliminary design, book 1
[NASA-CR-174735-VOL-2-BK-1] N86-15722
Mod-5A wind turbine generator program design report. Volume 2: Conceptual and preliminary design, book 2
[NASA-CR-174735-VOL-2-BK-2] N86-15723
Mod-5A wind turbine generator program design report. Volume 3: Final design and system description, book 1
[NASA-CR-174735-VOL-3-BK-1] N86-15724
Mod-5A wind turbine generator program design report. Volume 3: Final design and system description, book 2
[NASA-CR-174735-VOL-3-BK-2] N86-15725
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 1
[NASA-CR-174735-VOL-4-BK-1] N86-15726
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 2
[NASA-CR-174735-VOL-4-BK-2] N86-15727
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 3
[NASA-CR-174735-VOL-4-BK-3] N86-15728
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 4
[NASA-CR-174735-VOL-4-BK-4] N86-15729
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 5
[NASA-CR-174735-VOL-4-BK-5] N86-15730
ENGINES
Small turbine technology review
[AD-A158514] N86-15316
ENTHALPY
Melting and consolidation of nickel alloy powders with a plasma jet operating in a low pressure inert environment N86-15374
ENTRAINMENT
The movement of a cluster of particles subject to the effect of gravity and their sedimentation onto a plane horizontal surface
[BLL-RISLEY-TR-5161-(9091.9F)] N86-15623
ENTROPY
Transient three phase, three component flow. Part 2: One-dimensional slip model, comparison theory-experiment
[KFK-3926-PT-2] N86-15646
Merits and demerits of the Maximum Entropy Spectral Analysis (MESA) method
[INPE-3590-PRE/787] N86-16012
Inadmissibility of the best equivariant estimators of the variance-covariance matrix and the generalized variance under entropy loss
[AD-A159059] N86-16020
ENUMERATION
A new enumeration scheme for the knapsack problem
[INPE-3563-PRE/769] N86-15983
An exact algorithm for the knapsack problem
[INPE-3645-PRE/815] N86-15984
ENVIRONMENT EFFECTS
Environmental considerations and waste planning on the lunar surface: An interactive qualifying N86-15331
ENVIRONMENT SIMULATION
Some aspects of determining human physical work capacity under hyperbaric conditions N86-15867
ENVIRONMENTAL SURVEYS
Variability of major organic components in aircraft fuels
[AD-A159057] N86-15415
ENVIRONMENTS
Light helicopter family trade-off analysis. Volume 10: Appendices V, W, X, and Z
[AD-A158079] N86-15309
EPOXY RESINS
Static and dynamic material model for elastohydrodynamic bearing calculations
[IWECO-5076503] N86-15676
Formation of volatile substances during polymer destruction by Pseudomonas aeruginosa N86-15884
EQUATIONS OF MOTION
A fault tolerant system for an integrated avionics sensor configuration
[NASA-CR-3834] N86-15278
The influence of dynamic inflow and torsional flexibility on rotor damping in forward flight from symbolically generated equations N86-15295
Flap-lag-torsion stability in forward flight N86-15296
Determination of electromagnetic forces in magnetic field calculations N86-15504
Equilibrium positions and equilibrium domains of autonomous systems
[RUB-IFM-MITT-45] N86-15982
EQUATIONS OF STATE
Stellar core collapse and supernova
[DE85-017398] N86-16172
EQUATORS
Properties of the internal wave field on the equator N86-15839
Observations of equatorially trapped waves in the eastern Atlantic Ocean from inverted echo sounders N86-15840
EQUILIBRIUM
The TMA shallow-water spectrum description and applications
[AD-A157975] N86-15844
EQUILIBRIUM METHODS
Equilibrium positions and equilibrium domains of autonomous systems
[RUB-IFM-MITT-45] N86-15982
EQUIPARTITION THEOREM
Connectance and equipartition thresholds in hamiltonian systems
[PREPRINT-445] N86-16010
EQUIVALENT CIRCUITS
Dependence of electric current through human body on parameters of 3-0 network in range of high insulation admittance N86-15588
ERROR ANALYSIS
Reducing dynamic errors of integrated-circuit CMOS switches N86-15492
An examination of some error correcting techniques for continuous speech recognition technology
[AD-A158001] N86-15521
Programs to compute the Circular Error Probability (CEP) of a location system with direction finding stations
[FEL-1985-20] N86-15538
Control and identification of time varying systems
[AD-A159067] N86-15999
Estimation of the trajectory parameters of an accelerationless target from angle measurements of a single, stationary, acoustic sensor. Error sources and their influence
[REPT-12-84] N86-16039
Wavelength error analysis in a multiple-beam Fizeau laser wavemeter having a linear diode array readout
[NASA-TM-87614] N86-16089
ERROR CORRECTING CODES
Microprocessor application in error code correction N86-15480
ERROR CORRECTING DEVICES
An examination of some error correcting techniques for continuous speech recognition technology
[AD-A158001] N86-15521
ERROR DETECTION CODES
Raising the reliability of a remote processing system N86-15928
Automated flaw detection information-measuring system N86-15941
Ada (trade name) compiler validation summary report: Rational environment, version A.2.0.6 for rational R1000
[AD-A157830] N86-15949
ERROR SIGNALS
Research in adaptive beamforming for satellite communications
[AD-A157828] N86-15520
Detection of periodic signal of arbitrary shape with random time delay
[AD-A158979] N86-15524
ERRORS
Basic characteristics of radar antenna with synthesized aperture tracking arbitrary motion of aircraft N86-15575
Lower limit of error probability in discrete addition of binary signals from parallel channels N86-15586
A perturbation approach to robot calibration
[AD-A159166] N86-16004
Merits and demerits of the Maximum Entropy Spectral Analysis (MESA) method
[INPE-3590-PRE/787] N86-16012
ESTIMATES
Response of the mesoscale atmosphere to diabatic heating N86-15794
ESTIMATING
Estimating number and parameters of signal components in presence of noise N86-15567
Merits and demerits of the Maximum Entropy Spectral Analysis (MESA) method
[INPE-3590-PRE/787] N86-16012
ESTUARIES
Evaluation of spatial, radiometric and spectral Thematic Mapper performance for coastal studies
[E86-10016] N86-15706
ETCHING
Bulletin of the Faculty of Engineering, Hokkaido University, no. 128
[ISSN-0385-602X] N86-15420
A study of reactive sputter etching for carbon steel by Freon gas: On the effect of oxygen gas mixture N86-15422
Selective anodic oxidation of semiconductors for pattern generation
[AD-D011889] N86-16133
EULER EQUATIONS OF MOTION
Objectives and scope of the Working Group 07 N86-15257
Formulation of the Euler boundary value problem N86-15258
Numerical methods N86-15259
Exact solutions to transonic and supersonic flows N86-15260
Numerical solutions for three-dimensional cases: Swept wings N86-15263
Concluding remarks N86-15265
EUROPEAN AIRBUS
West Europe report: Science and technology
[JPRS-WST-85-024] N86-15447
MBB studies variable-camber wing for Airbus N86-15449
EUROPEAN SPACE AGENCY
Launchers, satellites, multinational plans in 1985 CHES budget N86-15448
EUTECTIC ALLOYS
Properties of optical filters on CdSe-HgSe base N86-15506
EVALUATION
Studies of molecular properties of polymeric materials: Aerospace environmental effects on three linear polymers
[NASA-TM-87532] N86-15391
Predicting and diagnosing performance of transistors, integrated circuits and large-scale-integration systems by multilevel simulation methods and programs N86-15487
An examination of some error correcting techniques for continuous speech recognition technology
[AD-A158001] N86-15521
Visual display parameters
[AD-A158773] N86-15654
LANDSAT TM image data quality analysis for energy-related applications
[E86-10009] N86-15703
Research and development of an aimed magnetic lead current density-magnetic field diagnostic
[DE85-014720] N86-16060
EVAPORATION RATE
Droplet size and evaporation rate within a two-phase flow by morphology-dependent resonances in the optical spectra
[AD-A158931] N86-16091
EXCIMER LASERS
Delay effect in pulsed avalanche discharge of an XeCl laser at high gas pressure N86-15482
EXCITATION
Mechanisms of excitation and ionization processes in sputtering
[AD-A158061] N86-15361
Internal conditions for self excitation of superconductor DC generators N86-15606
EXERCISE PHYSIOLOGY
Effect of 7-day immersion hypokinesia on characteristics of precision movements N86-15874
EXHAUST SYSTEMS
Resonant cavities for stall recovery in gas turbine engines
[AD-D011891] N86-15317
EXOBIOLOGY
USSR report: Space Biology and Aerospace Medicine, volume 19, no. 4, July - August 1985
[JPRS-USB-85-006] N86-15865
EXPERIENCE
Experience and performance in video games and its influence on aptitude tests in aviation psychology
[DFVLR-FB-85-43] N86-15915
EXPERIMENT DESIGN
Plasmas as light sources for lasers
[AD-A159460] N86-15666
A delayed random choice quantum mechanics experiment using light quanta N86-16143

EXPERT SYSTEMS
USSR report: Cybernetics, computers and automation technology
[JPRS-UCC-85-009] N86-15943
Expert systems in engineering practice
[ISBN-90-6818-018-5] N86-15977
EXPLODING WIRES
Preliminary results of velocities and deceleration of aluminum, magnesium, zirconium, tantalum, pyrofuze and titanium particles burning in steam
[AD-A159141] N86-15365
Burning time and size of aluminum, magnesium, zirconium, tantalum, and pyrofuze particles burning in steam
[AD-A159161] N86-15366
EXPLOSIVE FORMING
Mach stem characterization in Mbar designs using RSR powder
[DE85-015700] N86-15385
EXPLOSIVES
Extrusion cast explosive
[DE85-017785] N86-15417
Miniature plasma accelerating detonator and method of detonating insensitive materials
[DE85-017747] N86-15418
Spectroscopic studies of detonating heterogeneous explosives
[DE85-007687] N86-15419
Wave motion analysis of a nonspinning liquid filled cylinder
[AD-A159324] N86-15636
Color post-processor for the EPIC-2 computer program
[AD-A159321] N86-15961
EXPONENTIAL FUNCTIONS
On the number of bootstrap simulations required to construct a confidence interval
[AD-A158880] N86-16016
EXTERNAL COMBUSTION ENGINES
Results of wind tunnel tests on external combustion
[DFVLR-FB-85-35] N86-15643
EXTERNAL STORES
Flutter generator control and force computer
[AEL-0242-TM] N86-15318
EXTRUDING
Extrusion cast explosive
[DE85-017785] N86-15417
EYE MOVEMENTS
Application of the system identification technique to goal-directed saccades
[AD-A159102] N86-15909

F

F-111 AIRCRAFT
F-111 natural laminar flow glove flight test data analysis and boundary layer stability analysis
[NASA-CR-166051] N86-15305
FABRICATION
Generation of electromagnetic radiation in radio-frequency band in solids exposed to laser radiation N86-15509
Electrical characteristics of Si devices fabricated with completely consumed carbide (C3) dielectric isolation process
[AD-A158296] N86-15547
Development and fabrication of photovoltaic concentrator modules for a point-focus Fresnel lens array
[DE85-017322] N86-15734
FABRY-PEROT INTERFEROMETERS
Auroral thermosphere temperatures from observations of 6300 A emissions
[NASA-TM-86530] N86-15755
FACE CENTERED CUBIC LATTICES
First-principles calculation of the magnetic properties of paramagnetic fcc iron
[DE85-017155] N86-16035
FACILITIES
Implementation of multifunction information systems at three Navy facilities
[AD-A157797] N86-16153
FAILURE
The relationship between material failures and flight hours: Statistical considerations
[AD-A159571] N86-15311
Analysis of drops in accuracy of least-squares approximation N86-15428
FAILURE ANALYSIS
The relationship between material failures and flight hours: Statistical considerations
[AD-A159571] N86-15311
Effects of load proportioning on the capacity of multiple-hole composite joints
[NASA-CR-178019] N86-15687
Techniques for fatigue life predictions from measured strains
[NASA-CR-178574] N86-15688
Techniques for fatigue life predictions from measured strains. Appendix E: HPOTP bearing cartridge and MCC coolant inlet duct power spectral densities
[NASA-CR-178515] N86-15689
Airborne Doppler lidar activities N86-15793
FAILURE MODES
Effect of stress concentrations in composite structures
[NASA-CR-176410] N86-15348
Limit analysis of transversely loaded grillages
[AD-A158988] N86-15692
FALLOUT
Worldwide deposition of (90)Sr through 1983
[DE85-017599] N86-15741
FARMLANDS
Systematic and random variations in digital Thematic Mapper data
[E86-10018] N86-15711
FAST FOURIER TRANSFORMATIONS
Computational models of human vision with applications
[NASA-CR-176413] N86-15898
Ultrasonic transit time measurements using fast analog to digital conversion and a fast fourier transform based algorithm
[AD-A159426] N86-16049
FATIGUE (MATERIALS)
Effects of chemistry and processing on the fracture related properties of P/M alloy CT91
[AD-A159299] N86-15383
Use of ultrasonics to determine the crack size in high strength steel gun barrels
[AD-A159405] N86-15683
Stress analysis on screw thread
[AD-A159347] N86-15693
FATIGUE LIFE
Techniques for fatigue life predictions from measured strains
[NASA-CR-178574] N86-15688
Techniques for fatigue life predictions from measured strains. Appendix E: HPOTP bearing cartridge and MCC coolant inlet duct power spectral densities
[NASA-CR-178515] N86-15689
FATIGUE TESTS
Digital servocontroller system. Volume 2. Maintenance manual
[AD-A159066] N86-15322
Thermal-mechanical fatigue test apparatus for metal matrix composites and joint attachments
[NASA-TM-87187] N86-15378
FATTY ACIDS
Gas chromatographic analysis of free fatty acids of skin surface lipids N86-15891
FAULT TOLERANCE
A fault tolerant system for an integrated avionics sensor configuration
[NASA-CR-3834] N86-15278
The ISIS project: R and D status and technical report
[AD-A158930] N86-15959
Distributed FIFO allocation of identical resources using small shared space
[AD-A159151] N86-15978
FEEDBACK
PIFCGT: A PIF autopilot design program for general aviation aircraft
[NASA-CR-166123] N86-15320
Control and identification of time varying systems
[AD-A159067] N86-15999
FEEDBACK AMPLIFIERS
Nonsinusoidal modes of oscillator with multifrequency surface-acoustic-wave resonator N86-15488
FEEDBACK CONTROL
Specific recommendations for improving network feedback to hosts
[AD-A158768] N86-15924
FEMALES
Comparison of the Air Force female and male pilot grounded time in the Air Force Military Airlift Command
[AD-A158093] N86-15902
A comparison of the effects of circuit weight training on men and women
[AD-A159419] N86-15910
Can aircraft noise less than or equal 115 to dBA adversely affect reproductive outcome in USAF women?
[AD-A158322] N86-16045
FERMI SURFACES
Structural transformations in semiconductors during optical pumping N86-15490
Metal-insulator transition and Landau Fermi liquid theory
[NOTA-INTERNA-844] N86-16142
FERMI-DIRAC STATISTICS
Statistical model for the trapping of interstitials by substitutional (interstitial) atoms in solids
[PREPRINT-442] N86-16141
FERRITES
Mechanical properties and deformation behavior of martensite-ferrite dual-phase steels N86-15373
Experimental study of unidirectional ferrite microstrip lines N86-15500
FERRITIC STAINLESS STEELS
Low activation ferritic alloys
[DE85-017795] N86-15384
FERROELECTRICITY
Research on the crystal growth and dielectric properties of high permittivity ferroelectric materials
[AD-A157820] N86-16126
FERROMAGNETIC FILMS
Experimental study of magnetostatic wave propagation through film waveguides N86-15565
FERROMAGNETIC MATERIALS
Modulation instability and solitons of electromagnetic wave envelopes in ferromagnetic semiconductors N86-15578
Thin superconducting film characterization by surface acoustic waves
[AD-A158311] N86-16127
FERROMAGNETIC RESONANCE
Ferromagnetic resonance probe liftoff suppression apparatus
[AD-D011913] N86-15647
FIBER OPTICS
Digital servocontroller system. Volume 2. Maintenance manual
[AD-A159066] N86-15322
Optical emission line monitor with background observation and cancellation
[DE85-017745] N86-15370
Transmission of television signals over optical communication channel by means of frequency modulation N86-15495
Apparatus for experimental study of high-resolution radiometers and their characteristics N86-15496
Influence of roughness of ends of fiber optic plates on modulation transfer coefficient N86-15508
Digital television routing systems: An introduction to integrated optical waveguide techniques and devices
[BBC-RD-1985/9] N86-15515
Analysis of automated light guide pulse dispersion measurement N86-15605
Development of a photonic data recorder
[DE85-017120] N86-15655
Use of optical fibers in pulsed holography
[ISL-CO-231/84] N86-15657
Subnanosecond short wavelength generation using optical fibers
[AD-A158769] N86-16090
FIBER ORIENTATION
Stress concentration around a small circular hole in the HiMAT composite plate
[NASA-TM-86038] N86-15350
FIBERS
Moldable electrically conductive polymer compositions
[AD-D011887] N86-15402
FIELD EFFECT TRANSISTORS
Noise characteristics of stroboscopic transducers built with GaAs microcircuit integration N86-15489
The Surface Acoustic Wave (SAW) chemisensor. Part 1: A literature review
[PML-1985-3-PT-1] N86-15649
FIELD STRENGTH
Investigations of the interference scattering and methods for its suppression in near-ground radar backscattering measurements
[DFVLR-FB-85-42] N86-15539
FIELD THEORY (PHYSICS)
Corrections to universal scaling for the 2D nonlinear sigma model on the lattice
[PREPRINT-460] N86-16145
Stochastic theory of emission and absorption of quanta
[NOTA-INTERNA-847] N86-16147
FIGHTER AIRCRAFT
Investigation of a supersonic cruise fighter model flow field
[NASA-TM-86361] N86-15248
Numerical simulation of viscous supersonic flow over a generic fighter configuration
[NASA-TM-86823] N86-15627
FILAMENT WINDING
Self-quenching streamer discharge characteristics at extreme gas compositions N86-15442
FILM THICKNESS
Dynamic response of film thickness in spiral-groove face seals
[NASA-TP-2544] N86-15313

FINE STRUCTURE
Further explorations of cosmogonic shadow effects in the Saturnian rings
[NASA-CR-176441] N86-16177
FINITE DIFFERENCE THEORY
Modal analysis of unstable resonators
[AD-A159225] N86-15663
FINITE ELEMENT METHOD
Dynamic stability of a bearingless circulation control rotor blade in hover N86-15297
Planning, creating and documenting a NASTRAN finite element model of a modern helicopter N86-15300
An analysis of cross-coupling of a multicomponent jet engine test stand using finite element modeling techniques
[NASA-CR-176424] N86-15323
Concepts for the development of a nondestructive testing and evaluation system for rigid airfield pavements
[AD-A158004] N86-15324
Color post-processor for the EPIC-2 computer program
[AD-A159321] N86-15961
Application and implementation of transient algorithms in computer programs
[DE85-015396] N86-15968
FINNED BODIES
Damping of the rolling motion of full caliber fin-stabilized projectiles in supersonic flight
[ISL-CO-233/84] N86-15253
FIRE PREVENTION
Summaries of Center for Fire Research grants and in-house programs, 1985
[NBSIR-85-3258] N86-15429
FISSION
Friction in nuclear dynamics
[DE85-011984] N86-16066
FITNESS
Analysis of drops in accuracy of least-squares approximation N86-15428
FIZEAU EFFECT
Wavelength error analysis in a multiple-beam Fizeau laser wavemeter having a linear diode array readout
[NASA-TM-87614] N86-16089
FLAME PROPAGATION
Multi-dimensional combustion instability analysis of solid propellant rocket motors
[AD-A158314] N86-15414
FLAPPING
The flapping movement and frequency of rotating windmill wings defined with a differential equation
[IW-R501] N86-15255
FLAPPING HINGES
Flap-lag-torsion stability in forward flight N86-15296
FLASH BLINDNESS
Potency of photoflash-produced retrograde amnesia in rats
[AD-A159149] N86-15859
FLASHING (VAPORIZING)
165-kW open-cycle OTEC experiment
[DE85-008818] N86-15735
FLEXIBLE WINGS
Prediction of wing aeroelastic effects on aircraft lift and pitching moment characteristics
[NASA-TM-87631] N86-15319
FLIGHT CHARACTERISTICS
Aircraft flight performance methods. Revision 2
[AD-A158227] N86-15310
Prediction of wing aeroelastic effects on aircraft lift and pitching moment characteristics
[NASA-TM-87631] N86-15319
FLIGHT CONTROL
PIFCGT: A PIF autopilot design program for general aviation aircraft
[NASA-CR-166123] N86-15320
Work on putting computer and CRTs in airliner control panels N86-15947
FLIGHT CREWS
One aspect of crew training N86-15885
FLIGHT PATHS
An optimisation method for reconstruction of flight path trajectories from non-synchronous time-sampled observations by two cine cameras
[ARL-SYS-R-34] N86-15279
Aircraft flight performance methods. Revision 2
[AD-A158227] N86-15310
FLIGHT SIMULATION
Use of flight simulators for demonstration of functional capacities of flight personnel N86-15870
FLIGHT TESTS
Performance and loads data from a hover test of a full-scale XV-15 rotor
[NASA-TM-86833] N86-15243
Adaptation of a modern medium helicopter (Sikorsky S-76) to higher harmonic control N86-15303
F-111 natural laminar flow glove flight test data analysis and boundary layer stability analysis
[NASA-CR-166051] N86-15305
Prediction of wing aeroelastic effects on aircraft lift and pitching moment characteristics
[NASA-TM-87631] N86-15319
FLIGHT TIME
The relationship between material failures and flight hours: Statistical considerations
[AD-A159571] N86-15311
Comparison of the Air Force female and male pilot grounded time in the Air Force Military Airlift Command
[AD-A158093] N86-15902
FLOATING POINT ARITHMETIC
Modular floating decimal point operations for antenna array adaptation N86-15568
FLOQUET THEOREM
Ground resonance analysis using a substructure modeling approach N86-15282
FLOW CHARACTERISTICS
Activities and results report for the special domain 210 --- fluid mechanics
[KU-SFB-210/A/11] N86-15645
Airborne Doppler measurements of the central California extended sea breeze N86-15791
FLOW DISTRIBUTION
The experimental determination of the subsonic aerodynamic characteristics of an Ogive-Cylinder body including a comparison with theoretical estimates, volume 1
[CAR-8509] N86-15242
Investigation of a supersonic cruise fighter model flow field
[NASA-TM-86361] N86-15248
Fundamental study of flow field generated by rotorcraft blades using wide-field shadowgraph
[NASA-CR-176443] N86-15249
Test cases for inviscid flow field methods
[AGARD-AR-211] N86-15256
Objectives and scope of the Working Group 07 N86-15257
Formulation of the Euler boundary value problem N86-15258
Numerical methods N86-15259
Exact solutions to transonic and supersonic flows N86-15260
Reference test cases and contributors N86-15261
Numerical solutions of two-dimensional reference test cases N86-15262
Numerical solutions for three-dimensional cases: Swept wings N86-15263
Numerical solutions for three-dimensional cases: Delta wings N86-15264
Concluding remarks N86-15265
Boundary-layer transition: T-S waves and crossflow mechanisms N86-15268
Multi-dimensional combustion instability analysis of solid propellant rocket motors
[AD-A158314] N86-15414
Time-resolved flowfield measurements in a turbine stage
[AD-A158092] N86-15634
Results of wind tunnel tests on external combustion
[DFVLR-FB-85-35] N86-15643
Observations of equatorially trapped waves in the eastern Atlantic Ocean from inverted echo sounders N86-15840
Color post-processor for the EPIC-2 computer program
[AD-A159321] N86-15961
FLOW MEASUREMENT
FRG uses laser for non-destructive testing in wind canal N86-15451
Activities and results report for the special domain 210 --- fluid mechanics
[KU-SFB-210/A/11] N86-15645
Transient three phase, three component flow. Part 2: One-dimensional slip model, comparison theory-experiment
[KFK-3926-PT-2] N86-15646
FLOW THEORY
Transient three phase, three component flow. Part 2: One-dimensional slip model, comparison theory-experiment
[KFK-3926-PT-2] N86-15646
FLOW VELOCITY
Research into heat transfer by convection in the chamber of a furnace with relation to the angle at which a high velocity jet strikes a plane surface
[BLLD-M-36478-(5828.4)] N86-15624
Study of high speed combustion flows by laser velocimetry
[NASA-CR-176439] N86-15668
Approach to uncertainty assessment for fluid flow and contaminant transport modeling in heterogeneous groundwater systems
[DE85-016621] N86-15714
165-kW open-cycle OTEC experiment
[DE85-008818] N86-15735
FLOW VISUALIZATION
Flash X-ray with image enhancement applied to combustion events
[AD-A159328] N86-15369
Particle sizing with whisker collectors --- flow visualization
[ISL-CO-230/84] N86-15639
Investigation of large scale structures in a subsonic free jet
[DFVLR-FB-85-38] N86-15644
Demonstrate capabilities of digital graphics system to obtain quantitative information from flow visualization data
[AD-A158760] N86-15923
FLUID DYNAMICS
Relative advantages of thin-layer Navier-Stokes and interactive boundary-layer procedures
[NASA-TM-86778] N86-15244
Formulation of the Euler boundary value problem N86-15258
Demonstrate capabilities of digital graphics system to obtain quantitative information from flow visualization data
[AD-A158760] N86-15923
Brief introduction to the Soviet Central Research Institute of Aerodynamics
[AD-A159103] N86-16148
FLUID FLOW
Programming a multiple-orifice hydraulic decelerator
[AD-A159428] N86-15328
165-kW open-cycle OTEC experiment
[DE85-008818] N86-15735
The effect of the Benthic Boundary Layer on the physics of intense mesoscale eddies N86-15751
Demonstrate capabilities of digital graphics system to obtain quantitative information from flow visualization data
[AD-A158760] N86-15923
FLUID MECHANICS
Wave motion analysis of a nonspinning liquid filled cylinder
[AD-A159324] N86-15636
FLUID PRESSURE
The Dowling wall pressure-spectrum analogy applied to an isotropic two-layered elastic medium
[AD-A158009] N86-15632
FLUIDICS
Three-axis electrofluidic angular rate sensor for ejection seat steering thrust vector control
[AD-A159413] N86-15277
FLUIDIZED BED PROCESSORS
Fluidized reduction of oxides on fine metal powders without sintering
[NASA-TM-77928] N86-15379
FLUOROPOLYMERS
Demonstration of a pyroelectric conversion power cycle with a polymer
[AD-A158964] N86-15398
FLUTTER
Experimentally determined flutter from two- and three-bladed model bearingless rotors in hover N86-15286
Flutter generator control and force computer
[AEL-0242-TM] N86-15318
FLUX (RATE)
Cosmogenic neutron-capture-produced nuclides in stony meteorites
[DE85-012689] N86-16170
FLYWHEELS
Advanced Integrated Power and Attitude Control System (IPACS) study
[NASA-CR-3912] N86-15338
FOCUSING
Novel control circuit for proximity focused microchannel plate image intensifiers N86-15481
Self-guarding Schottky barrier infrared detector array
[AD-D011894] N86-15541
Collective accelerator for electron colliders
[DE85-012878] N86-16059
Characteristics of intense pulsed ion beam extracted from dual-current-feed magnetically-insulated diode N86-16103
FOG
The reduction of nocturnal cooling value by smudging N86-15696
Observations on the atmospheric electrical environment of sea fog in the Pacific Coast of Eastern Hokkaido, Japan N86-15697

FOKKER-PLANCK EQUATION
Investigations of laser initiated discharge channels [AD-A158872] N86-15660
FOOD INTAKE
Tritium ingestion in rats N86-15895
FORCE DISTRIBUTION
Determination of electromagnetic forces in magnetic field calculations N86-15504
FORECASTING
Single station assessment of atmospheric boundary layer properties in the eastern Mediterranean Sea [AD-A159432] N86-15827
Wave and surf forecast model evaluation for use on a micro computer [AD-A159063] N86-15848
FORMALISM
Path integral approach to birth-death processes on a lattice [NOTA-INTERNA-843] N86-16146
FORMING TECHNIQUES
Moldable electrically conductive polymer compositions [AD-D011887] N86-15402
FORMULAS (MATHEMATICS)
Mean residual life: Theory and applications [AD-A158589] N86-16013
FORTRAN
PIFCGT: A PIF autopilot design program for general aviation aircraft [NASA-CR-166123] N86-15320
Visual display parameters [AD-A158773] N86-15654
An interactive discrete controls analysis option (ORACLS) for the CONTROLS analysis package on the IBM 3033 [AD-A158754] N86-15956
FORWARD SCATTERING
The experimental investigation of the inverse problem in rough surface scattering of acoustic waves [AD-A158070] N86-16044
FOURIER TRANSFORMATION
Ultimate limits of FT-IR [DE85-016442] N86-15652
Auroral thermosphere temperatures from observations of 6300 A emissions [NASA-TM-86530] N86-15755
FRACTURE MECHANICS
Application of fracture mechanics principles to fatigue crack growth in a powder metallurgy Ni-base superalloy N86-15372
Combined mode 1 - mode 3 fracture toughness of high-strength low-alloy steel N86-15376
Effects of chemistry and processing on the fracture related properties of P/M alloy CT91 [AD-A159299] N86-15383
Fracture toughness testing of laser welds in 2 mm thick titanium alloy IMI 550 [REPT-3784/1/85] N86-15685
FRACTURE STRENGTH
Combined mode 1 - mode 3 fracture toughness of high-strength low-alloy steel N86-15376
Fracture toughness testing of laser welds in 2 mm thick titanium alloy IMI 550 [REPT-3784/1/85] N86-15685
FREE ELECTRON LASERS
China reaches new level in minicomputer development N86-15440
Theoretical studies of two-dimensional effects in free electron lasers [AD-A158229] N86-15659
Angular-gain spectrum of free electron lasers [AD-A159412] N86-15665
Stimulated Raman scattering in the atmosphere and its implication for FELs [DE85-016066] N86-16093
FREE FLOW
A consistent spatial differencing scheme for the transonic full-potential equation in three dimensions [NASA-TM-86716] N86-15246
Numerical methods N86-15259
Numerical simulation of viscous supersonic flow over a generic fighter configuration [NASA-TM-86823] N86-15627
FREE JETS
Investigation of large scale structures in a subsonic free jet [DFVLR-FB-85-38] N86-15644
FREE RADICALS
USSR report: Chemistry [JPRS-UCH-85-013] N86-15344
FREEZING
Cryogenic sample stage for the CAMECA IMS-3F ion microscope [AD-A158071] N86-15362
Freezing of living cells [DE85-016297] N86-15862
FREON
A study of reactive sputter etching for carbon steel by Freon gas: On the effect of oxygen gas mixture N86-15422
FREQUENCIES
Optimum frequency for propagation of sound in shallow sound channels [AD-A159064] N86-16047
FREQUENCY CONVERTERS
Efficiency of amplitude suppression on sinusoidal interference N86-15585
FREQUENCY DISTRIBUTION
Properties of the internal wave field on the equator N86-15839
FREQUENCY MODULATION
Transmission of television signals over optical communication channel by means of frequency modulation N86-15495
FREQUENCY RESPONSE
Frequency characteristics of differential optron N86-15497
FREQUENCY SYNCHRONIZATION
Accelerator timing system [LINO-109] N86-15560
FREQUENCY SYNTHESIZERS
Nonsinusoidal modes of oscillator with multifrequency surface-acoustic-wave resonator N86-15488
FRESNEL INTEGRALS
Modal analysis of unstable resonators [AD-A159225] N86-15663
FRESNEL LENSES
Development and fabrication of photovoltaic concentrator modules for a point-focus Fresnel lens array [DE85-017322] N86-15734
FRICTION MEASUREMENT
Investigation of the friction of Becorit 820 versus cast iron [WB-83/TRI-10053] N86-15675
FRINGE MULTIPLICATION
Wavelength error analysis in a multiple-beam Fizeau laser wavemeter having a linear diode array readout [NASA-TM-87614] N86-16089
FROST
Geophysical Bulletin of Hokkaido University, no. 46 [ISSN-0439-3503] N86-15695
The reduction of nocturnal cooling value by smudging N86-15696
FUEL COMBUSTION
Fuel effects on soot formation in turbojet engines [AD-A159073] N86-15416
Droplet size and evaporation rate within a two-phase flow by morphology-dependent resonances in the optical spectra [AD-A158931] N86-16091
FUEL INJECTION
Scramjet sidewall burning: Preliminary shock tunnel results [NASA-CR-176420] N86-15337
Preliminary study on the control of a direct injection diesel engine for better fuel flexibility and emissions control, parts 1 and 2 [TRITA-REG-8501] N86-15673
FUEL-AIR RATIO
Fuel effects on soot formation in turbojet engines [AD-A159073] N86-15416
FUNCTIONAL ANALYSIS
An interactive discrete controls analysis option (ORACLS) for the CONTROLS analysis package on the IBM 3033 [AD-A158754] N86-15956
FUNCTIONAL DESIGN SPECIFICATIONS
Mod-5A wind turbine generator program design report. Volume 2: Conceptual and preliminary design, book 1 [NASA-CR-174735-VOL-2-BK-1] N86-15722
Mod-5A wind turbine generator program design report. Volume 2: Conceptual and preliminary design, book 2 [NASA-CR-174735-VOL-2-BK-2] N86-15723
Mod-5A wind turbine generator program design report. Volume 3: Final design and system description, book 1 [NASA-CR-174735-VOL-3-BK-1] N86-15724
Mod-5A wind turbine generator program design report. Volume 3: Final design and system description, book 2 [NASA-CR-174735-VOL-3-BK-2] N86-15725
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 1 [NASA-CR-174735-VOL-4-BK-1] N86-15726
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 2 [NASA-CR-174735-VOL-4-BK-2] N86-15727
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 3 [NASA-CR-174735-VOL-4-BK-3] N86-15728
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 4 [NASA-CR-174735-VOL-4-BK-4] N86-15729
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 5 [NASA-CR-174735-VOL-4-BK-5] N86-15730
FUNCTIONS (MATHEMATICS)
Rapidly convergent algorithms for nonsmooth optimization [AD-A159168] N86-16005
FUSELAGES
The use of active controls to augment rotor/fuselage stability N86-15281
Influence of various unsteady aerodynamic models on the aeromechanical stability of a helicopter in ground resonance N86-15294
FUSION REACTORS
Large aspect ratio, high-beta tokamak fusion reactor [DE85-016654] N86-16122

G

GALACTIC EVOLUTION
Black holes, pregalactic stars and the dark matter problem [DE85-015385] N86-16168
GALERKIN METHOD
Thin-film bolometer power transduce electrodynamic analysis and experimental investigation N86-15609
GALLIUM ANTIMONIDES
Investigation of quantum effects in heterostructures [AD-A158327] N86-15550
GALLIUM ARSENIDES
Active microwave filters N86-15467
Investigation of quantum effects in heterostructures [AD-A158327] N86-15550
Investigation of reverse branch of voltage-current curve of GaAs high-voltage p-n structure N86-15614
DLTS (Deep-Level Transient Spectroscopy) analysis of germanium and Al sub x Ga sub 1-x As solar cells [AD-A159114] N86-15732
Submicron phonics 1 [AD-A159421] N86-16131
Selective anodic oxidation of semiconductors for pattern generation [AD-D011889] N86-16133
GAMMA RAY BURSTS
Emission region of gamma ray bursts [DE85-013198] N86-16183
Recurrent population 2 X-ray transients - similarities to SU UMa cataclysmic variables [DE85-014075] N86-16184
GAMMA RAY SPECTRA
Emission region of gamma ray bursts [DE85-013198] N86-16183
GAMMA RAY TELESCOPES
Search for positron annihilation line and continuum radiation from the Galactic Center [DE85-013964] N86-16169
GAS ANALYSIS
Electrochemical gas sensors and gas analysis equipment [DRIC-T-7521] N86-15354
Collection and analysis of NASA clean room air samples [NASA-CR-3947] N86-15358
GAS BEARINGS
Dynamic response of film thickness in spiral-groove face seals [NASA-TP-2544] N86-15313
GAS CHROMATOGRAPHY
Gas chromatographic analysis of free fatty acids of skin surface lipids N86-15891
GAS COMPOSITION
Self-quenching streamer discharge characteristics at extreme gas compositions N86-15442
GAS DENSITY
Multi-dimensional combustion instability analysis of solid propellant rocket motors [AD-A158314] N86-15414
GAS DISCHARGE TUBES
High-power sources with smoothly adjustable pulse duration for powering gas-discharge tubes of laser pumping systems N86-15498
High-power pulse generator with pulseform control for powering gas-discharge tubes of laser pumping systems N86-15499
GAS LASERS
High-power sources with smoothly adjustable pulse duration for powering gas-discharge tubes of laser pumping systems N86-15498
GAS PRESSURE
Time-resolved flowfield measurements in a turbine stage [AD-A158092] N86-15634

GAS TEMPERATURE
Dynamic gas temperature measurement system. Volume 2: Operation and program manual
[NASA-CR-168267] N86-15651
GAS TURBINE ENGINES
Resonant cavities for stall recovery in gas turbine engines
[AD-D011891] N86-15317
GAS TURBINES
Review of the development of small- and medium-capacity gas turbines at the Motoren- und Turbinen Union
[NASA-TM-77942] N86-15314
Small turbine technology review
[AD-A158514] N86-15316
Heat transfer characteristics within an array of impinging jets. Effects of crossflow temperature relative to jet temperature
[NASA-CR-3936] N86-15625
GASES
The movement of a cluster of particles subject to the effect of gravity and their sedimentation onto a plane horizontal surface
[BLL-RISLEY-TR-5161-(9091.9F)] N86-15623
Formation of volatile substances during polymer destruction by Pseudomonas aeruginosa N86-15884
GASOLINE
Aircraft accident report: Vieques Air Link, Inc., Britten-Norman BN-21-6 Islander, N589SA, Vieques, Puerto Rico, August 2, 1984
[PB85-901408] N86-15276
GATES (CIRCUITS)
Novel control circuit for proximity focused microchannel plate image intensifiers N86-15481
GAUSS EQUATION
A graphical similarity measure for time series models
[AD-A158869] N86-15996
GENERAL AVIATION AIRCRAFT
PIFCGT: A PIF autopilot design program for general aviation aircraft
[NASA-CR-166123] N86-15320
GENETIC ENGINEERING
Ultrasensitive detection of chemical substances
[AD-A158224] N86-15363
GEOCENTRIC COORDINATES
Investigation of factors determining pilot's geocentric orientation N86-15868
GEOCHEMISTRY
Geology, petrology, and geochemistry of a younger granite pluton, central Eastern Desert of Egypt; importance of mixing N86-15746
Technological applications of Earth core research
[AD-A158991] N86-15759
Radionuclide Migration Project 1984
[DE85-017383] N86-16076
GEOCORONAL EMISSIONS
Radiation pressure and the geocorona N86-15749
GEODESY
Variance component estimation method for sparse matrix applications
[PB85-234383] N86-16011
GEOGRAPHY
Description, analysis, and prediction of sea-floor roughness using spectral models
[AD-A158000] N86-15846
GEOLOGICAL FAULTS
Paleomagnetism and tectonics of the central and eastern Transverse Ranges, Southern California N86-15747
Structure and tectonics of the Long Island platform N86-15752
GEOLOGICAL SURVEYS
Structure and tectonics of the Long Island platform N86-15752
GEOLOGY
Geology, petrology, and geochemistry of a younger granite pluton, central Eastern Desert of Egypt; importance of mixing N86-15746
GEOMETRY
Aeroelastic considerations for torsionally soft rotors N86-15289
Synthesis of log-periodic antennas with prescribed geometry N86-15454
A perturbation approach to robot calibration
[AD-A159166] N86-16004
GEOPHYSICAL FLUID FLOW CELLS
Theoretical and experimental studies in support of the Geophysical Fluid Flow Experiment N86-15772
GEOPHYSICS
Geophysical Bulletin of Hokkaido University, no. 46
[ISSN-0439-3503] N86-15695
GEOSTROPHIC WIND
Utilization of satellite cloud information to diagnose the energy state and transformations in extratropical cyclones N86-15778
Mesoscale ageostrophic circulations associated with baroclinic jet streaks N86-15795
GEOSYNCHRONOUS ORBITS
The charge-state composition of 0.4-MeV helium ions in Earth's outer radiation belts during quiet times
[AD-A147561] N86-15757
Severe storm identification with satellite microwave radiometry: An initial investigation with Nimbus-7 SMMR data
[NASA-CR-176431] N86-15821
GEOTROPISM
Investigations of the effects of gravity on Paramecium caudatum structure and behavior
[DFVLR-FB-85-40] N86-15863
GERMANIUM
DLTS (Deep-Level Transient Spectroscopy) analysis of germanium and Al sub x Ga sub 1-x As solar cells
[AD-A159114] N86-15732
GERMANIUM COMPOUNDS
Noise characteristics of stroboscopic transducers built with GaAs microcircuit integration N86-15489
GLASS
Production of glass or glass-ceramic to metal seals with the application of pressure
[DE85-017746] N86-15403
GLOBAL ATMOSPHERIC RESEARCH PROGRAM
Estimation of precipitation from GOES IR imagery during FGGE: Application to diagnostic studies N86-15775
Dynamics and energetics of the South Pacific Convergence Zone during FGGE SOP-1 N86-15779
Remote sensing of severe convective storms N86-15800
GOES SATELLITES
NASA/MSFC FY-85 Atmospheric Processes Research Review
[NASA-CP-2402] N86-15769
Estimation of precipitation from GOES IR imagery during FGGE: Application to diagnostic studies N86-15775
Automated mesoscale winds derived from GOES multispectral imagery N86-15798
GOVERNMENTS
Implementation of multifunction information systems at three Navy facilities
[AD-A157797] N86-16153
GRADIENTS
Response of the mesoscale atmosphere to diabatic heating N86-15794
Location of noise sources using a phase-slope method
[NASA-TP-2505] N86-16041
GRAIN BOUNDARIES
Test for a possible melting transition in grain boundaries in aluminum near the melting point
[DE85-013238] N86-15387
GRAMMARS
Relational programming: Design and implementation of a prototype interpreter
[AD-A159404] N86-15962
The design and analysis of a stylized natural grammar for an object-oriented language (OMEGA)
[AD-A159434] N86-15964
GRANITE
Geology, petrology, and geochemistry of a younger granite pluton, central Eastern Desert of Egypt; importance of mixing N86-15746
GRANULAR MATERIALS
Thin superconducting film characterization by surface acoustic waves
[AD-A158311] N86-16127
GRAPHIC ARTS
Visual display parameters
[AD-A158773] N86-15654
GRAPHITE
Corrosion resistant magnesium-based materials for naval applications
[AD-A158012] N86-15351
GRAPHITE-EPOXY COMPOSITES
Mechanical properties testing of candidate polymer matrix materials for use in high performance composites
[NASA-CR-177970] N86-15349
Stress concentration around a small circular hole in the HiMAT composite plate
[NASA-TM-86038] N86-15350
GRAPHS (CHARTS)
Constructing a perfect matching is in Random NC
[AD-A157813] N86-15988
A graphical similarity measure for time series models
[AD-A158869] N86-15996
GRAVIMETRY
The IOS geophysical data held on magnetic tape - summary. Bathymetric, magnetic and gravity data collected during marine geology and geophysics cruises 1973 - 1984
[IOS-194] N86-15852
GRAVITATIONAL COLLAPSE
Stellar core collapse and supernova
[DE85-017398] N86-16172
GRAVITATIONAL EFFECTS
The movement of a cluster of particles subject to the effect of gravity and their sedimentation onto a plane horizontal surface
[BLL-RISLEY-TR-5161-(9091.9F)] N86-15623
Investigations of the effects of gravity on Paramecium caudatum structure and behavior
[DFVLR-FB-85-40] N86-15863
USSR report: Space Biology and Aerospace Medicine, volume 19, no. 4, July - August 1985
[JPRS-USB-85-006] N86-15865
GRAVITATIONAL WAVE ANTENNAS
Correlations between signals from gravitational wave antennas in Rome and in Geneva
[PREPRINT-462] N86-15533
GREENLAND
Mizlant 84 data report results of an oceanographic cruise to the Greenland Sea, August-September 1984
[AD-A157997] N86-15845
GROOVES
Dynamic response of film thickness in spiral-groove face seals
[NASA-TP-2544] N86-15313
GROUND RESONANCE
Ground resonance analysis using a substructure modeling approach N86-15282
Nonlinear dynamics of a helicopter model in ground resonance N86-15284
Development and application of a time-history analysis for rotorcraft dynamics based on a component approach N86-15291
GROUND WATER
Development of packed-tower air strippers for trichloroethylene removal at Wurtsmith Air Force Base, Michigan
[AD-A159139] N86-15326
Peat landforms along the Albany River, northern Ontario. An ecological study of peat landforms in Canada and Alaska
[E86-10014] N86-15704
Approach to uncertainty assessment for fluid flow and contaminant transport modeling in heterogeneous groundwater systems
[DE85-016621] N86-15714
Water resources data for California, water year 1983. Volume 3: Southern Central Valley Basins and the Great Basin from Walker River to Trucker River
[PB85-232312] N86-15720
Water resources data for Washington, water year 1982. Volume 2: Eastern Washington
[PB85-236834] N86-15721
Radionuclide Migration Project 1984
[DE85-017383] N86-16076
GROUND WAVE PROPAGATION
Ionosphere influence on MHD wave bundle propagation N86-15570
GROUP THEORY
Relation between the supertableaux of the supergroups orthosymplectic OSP (2 2) and superunity SU (1 2)
[PREPRINT-459] N86-16031
GROWTH
Investigation of distinctions referable to growth, development and metabolism of Closteriopsis acicularis algae when cells are limited in nitrogen as related to biological life-support systems for man N86-15883
GULF STREAM
Dynamics and structure of Gulf Stream meanders northeast of Cape Hatteras, N.C. N86-15841
GUN LAUNCHERS
New experimental techniques for probing gun barrel boundary layers
[ISL-CO-234/84] N86-15640
GUNN DIODES
Influence of higher types of oscillations on piston-tuned waveguide Gunn oscillator frequency N86-15611
GUNN EFFECT
Intrinsic magnetic field of electron beam N86-15590
GUNS (ORDNANCE)
Use of ultrasonics to determine the crack size in high strength steel gun barrels
[AD-A159405] N86-15683
GYROFREQUENCY
Self-modulation instability of gyrotron emission N86-15501

H

HADRONS
GGLP effect from 1959 to 1984
[DE85-011981] N86-16069

HALF LIFE
Tables of masses, binding energies, half-lives and natural abundances
[DE85-016344] N86-16061
HALL EFFECT
Novel transport and recombination processes in semiconductors
[AD-A158321] N86-15549
HAMILTONIAN FUNCTIONS
Three families of integrable one-particle potentials
[PREPRINT-440] N86-16007
Connectance and equipartition thresholds in hamiltonian systems
[PREPRINT-445] N86-16010
HARDNESS
Microstructural evaluation of 49Co-49Fe-2V alloy
[DE85-016500] N86-15388
HARDNESS TESTS
Microstructural origins of hot spots in RDX explosive and several reference inert materials
[AD-A158223] N86-15413
HARMONIC ANALYSIS
Wave motion analysis of a nonspinning liquid filled cylinder
[AD-A159324] N86-15636
HARMONIC CONTROL
Adaptation of a modern medium helicopter (Sikorsky S-76) to higher harmonic control N86-15303
HARMONICS
Observation of microwave Cerenkov radiation as diffraction pattern
[AD-A159337] N86-16057
HAZE
Studies of humid continental haze during SPACE N86-15813
HEAT EXCHANGERS
Development and fabrication of photovoltaic concentrator modules for a point-focus Fresnel lens array
[DE85-017322] N86-15734
HEAT OF COMBUSTION
Calculating the vulnerability of synthetic polymers to autoignition during nuclear flash
[AD-A159420] N86-15399
HEAT RESISTANT ALLOYS
Creep rupture behavior of Stirling engine materials
[NASA-TM-87209] N86-15380
Mach stem characterization in Mbar designs using RSR powder
[DE85-015700] N86-15385
HEAT STORAGE
Monitoring of hot water plume movements in an aquifer with borehole/surface resistivity measurements
[DE85-014531] N86-15637
HEAT TRANSFER
Analysis of the effects of transient heat transfer on axial flow compressor blade boundary layers
[AD-A158094] N86-15315
Solar rocket absorber
[AD-D011897] N86-15336
Heat transfer characteristics within an array of impinging jets. Effects of crossflow temperature relative to jet temperature
[NASA-CR-3936] N86-15625
Transient three phase, three component flow. Part 2: One-dimensional slip model, comparison theory-experiment
[KFK-3926-PT-2] N86-15646
165-kW open-cycle OTEC experiment
[DE85-008818] N86-15735
PETROS: A progam for calculating transport of heat, water, water vapor and air through a porous material
[DE85-013168] N86-15972
A computer simulation of the turbocharged turbo compounded diesel engine system: A description of the thermodynamic and heat transfer models
[NASA-CR-174971] N86-16164
HEAT TRANSFER COEFFICIENTS
Dynamic gas temperature measurement system. Volume 2: Operation and program manual
[NASA-CR-168267] N86-15651
HEAT TREATMENT
Effects of chemistry and processing on the fracture related properties of P/M alloy CT91
[AD-A159299] N86-15383
HEATING
The reduction of nocturnal cooling value by smudging N86-15696
HEAVY IONS
MBE-4, a heavy ion multiple-beam experiment
[DE85-016626] N86-16064
Superconducting linacs: Some recent developments
[DE85-014972] N86-16081
Transportable charge in a periodic alternating gradient system
[DE85-015664] N86-16085
HEIGHT
Response of the mesoscale atmosphere to diabatic heating N86-15794
HELICOPTER CONTROL
The use of active controls to augment rotor/fuselage stability N86-15281
HELICOPTER DESIGN
Activities report in aerospace research N86-15240
Rotorcraft Dynamics 1984
[NASA-CP-2400] N86-15280
Nonlinear dynamics of a helicopter model in ground resonance N86-15284
Optimal design application on the advanced aeroelastic rotor blade N86-15290
Development and application of a time-history analysis for rotorcraft dynamics based on a component approach N86-15291
HELICOPTER PERFORMANCE
Rotorcraft Dynamics 1984
[NASA-CP-2400] N86-15280
Optimal design application on the advanced aeroelastic rotor blade N86-15290
Light helicopter family trade-off analysis. Volume 4: Appendix N
[AD-A158075] N86-15306
HELICOPTERS
An optimisation method for reconstruction of flight path trajectories from non-synchronous time-sampled observations by two cine cameras
[ARL-SYS-R-34] N86-15279
Influence of various unsteady aerodynamic models on the aeromechanical stability of a helicopter in ground resonance N86-15294
Flap-lag-torsion stability in forward flight N86-15296
An examination of the relations between rotor vibratory loads and airframe vibrations N86-15299
Coupled rotor-body vibrations with inplane degrees of freedom N86-15301
Analysis of potential helicopter vibration reduction concepts N86-15302
Adaptation of a modern medium helicopter (Sikorsky S-76) to higher harmonic control N86-15303
Light helicopter family trade-off analysis. Volume 7: Appendix R
[AD-A158076] N86-15307
Light helicopter family trade-off analysis. Volume 8: Appendices S and T
[AD-A158077] N86-15308
Light helicopter family trade-off analysis. Volume 10: Appendices V, W, X, and Z
[AD-A158079] N86-15309
VHF-AM communications equipment selection and installation practices for helicopters
[DOT/FAA/PM-85/8] N86-15518
HELIUM
Hypersonic characteristics of an advanced aerospace plane at Mach 20.3
[NASA-TM-86435] N86-15245
HELIUM IONS
The charge-state composition of 0.4-MeV helium ions in Earth's outer radiation belts during quiet times
[AD-A147561] N86-15757
HETEROGENEITY
Strip and microstrip line periodic heterogeneities N86-15608
Systematic and random variations in digital Thematic Mapper data
[E86-10018] N86-15711
HETEROJUNCTION DEVICES
High-frequency characteristics of ballistic bipolar heterojunction transistors N86-15616
HETEROJUNCTIONS
Investigation of quantum effects in heterostructures
[AD-A158327] N86-15550
Investigation of reverse branch of voltage-current curve of GaAs high-voltage p-n structure N86-15614
Influence of embedded electrical fields on temperature stability of parameters of I-Ga-As heterophotoelements N86-15615
HIGH ALTITUDE
Investigation of catecholamine metabolism at high altitudes N86-15880
White light solar corona: An atlas of 1984 K-coronameter synoptic charts, December 1983 - January 1985
[PB85-191021] N86-16180
HIGH ENERGY INTERACTIONS
Cosmogenic neutron-capture-produced nuclides in stony meteorites
[DE85-012689] N86-16170
HIGH FREQUENCIES
Surface passivation of semiconductor circuit elements with layer of wideband semiconductor N86-15485
Nonsinusoidal modes of oscillator with multifrequency surface-acoustic-wave resonator N86-15488
A brief investigation of adaptive decision feedback equalization for digital HF links employing PSK (Phase Shift Keying) modulation
[AD-A157809] N86-15545
High-frequency characteristics of ballistic bipolar heterojunction transistors N86-15616
Can aircraft noise less than or equal 115 to dBA adversely affect reproductive outcome in USAF women?
[AD-A158322] N86-16045
HIGH GAIN
Micro-power dissipation device described N86-15441
HIGH LEVEL LANGUAGES
Robotron hardware compatible programming languages surveyed N86-15474
HIGH POWER LASERS
Delay effect in pulsed avalanche discharge of an XeCl laser at high gas pressure N86-15482
Coupled high power waveguide laser research
[AD-A159079] N86-15662
Interface alignment system
[AD-D011896] N86-16087
HIGH RESOLUTION
Apparatus for experimental study of high-resolution radiometers and their characteristics N86-15496
Short-lived solar burst spectral component at approximately 100 GHz
[INPE-3550-PRE/762] N86-16178
HIGH SPEED
Transverse motion of high speed barium clouds in the ionosphere
[AD-A159058] N86-15760
High-speed receivers of microprocessor signal conversion devices N86-15938
HIGH SPEED PHOTOGRAPHY
Novel control circuit for proximity focused microchannel plate image intensifiers N86-15481
HIGH STRENGTH
Fundamental studies on the Aluminum-Lithium-Beryllium alloy system
[AD-A158088] N86-15381
HIGH STRENGTH STEELS
The role of microstructure in hydrogen-assisted crack initiation in high strength steels N86-15375
Use of ultrasonics to determine the crack size in high strength steel gun barrels
[AD-A159405] N86-15683
HIGH TEMPERATURE
Novel sorbents for high temperature regenerative H2S removal
[NASA-CR-176449] N86-15360
Reducing dynamic errors of integrated-circuit CMOS switches N86-15492
Integrating sphere spectrometer for high-temperature materials characterization
[DE85-012170] N86-15656
Structural examination of iridium-based single-crystal preparations
[DE85-017550] N86-16136
HIGH TEMPERATURE AIR
Condensation potential in high thermal performance walls. Hot, humid summer climate
[AD-A158002] N86-15431
HIGH VOLTAGES
Methods of equalizing electric fields in high-voltage devices N86-15587
Experimental determination of turn-off time of high-voltage power thyristors N86-15602
Operation at high voltage and power brightness of ion beam on conical pinched electron beam diode N86-16105
HIGHLY MANEUVERABLE AIRCRAFT
Stress concentration around a small circular hole in the HiMAT composite plate
[NASA-TM-86038] N86-15350
HILBERT SPACE
Nonlinear control of distributed parameter systems
[INPE-3623-PRE/807] N86-15986
Stochastic integration for operator valued processes on Hilbert spaces and on nuclear spaces
[AD-A158878] N86-16014
On the angle for stationary random fields
[AD-A158982] N86-16018
HISTOCHEMICAL ANALYSIS
Freezing of living cells
[DE85-016297] N86-15862
HISTORIES
Searching the horizon: A history of Ames Research Center, 1940-1976
[NASA-SP-4304] N86-16185
HMX
Critical analysis of nitramine decomposition data: Product distributions from HMX and RDX decomposition
[AD-A159325] N86-15368

HOLE GEOMETRY (MECHANICS)
Stress concentration around a small circular hole in the HiMAT composite plate
[NASA-TM-86038] N86-15350
HOLES (ELECTRON DEFICIENCIES)
Predicting and diagnosing performance of transistors, integrated circuits and large-scale-integration systems by multilevel simulation methods and programs
N86-15487
HOLOGRAMMETRY
Investigation of hologram analyzer with single-component optical hologram matching system
N86-15507
HOLOGRAPHIC INTERFEROMETRY
Use of optical fibers in pulsed holography
[ISL-CO-231/84] N86-15657
HOLOGRAPHY
Characteristics of radar objects detectable by superwide-band signals N86-15576
Mathematical theory of holographic memory
N86-15946
HOMOGENEITY
A general model for the homogeneous case of the continuous response
[AD-A159345] N86-15914
HORIZONTAL ORIENTATION
Programming a multiple-orifice hydraulic decelerator
[AD-A159428] N86-15328
A buffer diverter system
[AD-D011902] N86-15559
HOT PRESSING
Hot isostatic pressing of ceramics
[NASA-TM-77931] N86-15397
Production of glass or glass-ceramic to metal seals with the application of pressure
[DE85-017746] N86-15403
HOVERING
Performance and loads data from a hover test of a full-scale XV-15 rotor
[NASA-TM-86833] N86-15243
Test results from a dynamic model dynaflex rotor
N86-15285
Experimentally determined flutter from two- and three-bladed model bearingless rotors in hover
N86-15286
Dynamic stability of a bearingless circulation control rotor blade in hover N86-15297
HUBS
Evaluation of a load cell model for dynamic calibration of the rotor systems research aircraft N86-15304
HUMAN BEINGS
Dependence of electric current through human body on parameters of 3-0 network in range of high insulation admittance N86-15588
Man's tolerance to fulminant form of hypoxic hypoxia
N86-15879
A comparison of the effects of circuit weight training on men and women
[AD-A159419] N86-15910
On looking into the black box: Prospects and limits in the search for mental models
[AD-A159080] N86-15913
Possibility of artificial intelligence in computers
N86-15944
Can aircraft noise less than or equal 115 to dBA adversely affect reproductive outcome in USAF women?
[AD-A158322] N86-16045
HUMAN FACTORS ENGINEERING
Light helicopter family trade-off analysis. Volume 7: Appendix R
[AD-A158076] N86-15307
Real-time digital terrain image generator
[AD-A159316] N86-15327
Problems of studying flight work in Soviet aviation medicine of the 1920's - 1930's N86-15866
Human factors engineering design criteria for future systems. Report number 3: Design criteria evolving from the Multiple Multiple Rocket System (MLRS) operational test 3
[AD-A158316] N86-15916
A study of data entry keyboards: The 4 x 4 keypad
[AD-A159095] N86-15926
A design evaluation checklist for user-system interface software
[AD-A158599] N86-15954
HUMAN PERFORMANCE
USSR report: Space Biology and Aerospace Medicine, volume 19, no. 4, July - August 1985
[JPRS-USB-85-006] N86-15865
Some aspects of determining human physical work capacity under hyperbaric conditions N86-15867
Some effects of alcohol and simulated altitude on complex performance scores and breathanalyzer readings
[AD-A158925] N86-15905
A comparison of the effects of circuit weight training on men and women
[AD-A159419] N86-15910
HUMIDITY
Predictive models for gaseous-phase carbon adsorption and humidity effects on trichloroethylene adsorption
[AD-A159167] N86-15367
Condensation potential in high thermal performance walls. Hot, humid summer climate
[AD-A158002] N86-15431
Temperature and humidity data for design: British forces area of West Germany
[MET-O-MEMO-113] N86-15767
Studies of humid continental haze during SPACE
N86-15813
HURRICANES
Storm severity detection (RF) N86-15784
HYBRID CIRCUITS
Standardization of Schwarz-Christoffel transformation for engineering design of semiconductor and hybrid integrated-circuit elements N86-15620
HYDRAULIC EQUIPMENT
Programming a multiple-orifice hydraulic decelerator
[AD-A159428] N86-15328
HYDROCARBONS
The catalytic activity and selectivity of chemical treated clinoptilolite in the conversion of methanol N86-15424
HYDRODYNAMIC EQUATIONS
A conservation law related to Kelvin's circulation theorem
[AD-A157819] N86-15631
HYDRODYNAMICS
Turbulent drag reduction for external flows
N86-15271
Multi-dimensional combustion instability analysis of solid propellant rocket motors
[AD-A158314] N86-15414
The movement of a cluster of particles subject to the effect of gravity and their sedimentation onto a plane horizontal surface
[BLL-RISLEY-TR-5161-(9091.9F)] N86-15623
Hydrodynamic noise and surface compliance--an overview of the Naval Underwater Systems Center IR/IED program
[AD-A157799] N86-15630
Evolution of nonlinear wave groups on water of slowly-varying depth
[AD-A158860] N86-15635
HYDROFLUORIC ACID
In search of high J states in the HF(v, J) system
[AD-A158937] N86-16073
HYDROGEN
Solar rocket absorber
[AD-D011897] N86-15336
The application of diffusion theory to the analysis of hydrogen desorption data at 25 deg C
[NASA-TM-86531] N86-15359
The role of microstructure in hydrogen-assisted crack initiation in high strength steels N86-15375
Hydrogen diffusion, positron annihilation in 40CrNiMo steel N86-15439
Photoluminescent response of palladium-cadmium sulfide and palladium-graded cadmium sulfoselenide Schottky diodes to molecular hydrogen
[AD-A158759] N86-15552
Laser plus surface-dynamics facility
[AD-A158922] N86-15661
HYDROGEN EMBRITTLEMENT
The role of hydrogen embrittlement in intergranular stress corrosion cracking of sensitized type 304 stainless steel
[TI85-014965] N86-15386
HYDROGEN FUELS
Scramjet sidewall burning: Preliminary shock tunnel results
[NASA-CR-176420] N86-15337
Creep rupture behavior of Stirling engine materials
[NASA-TM-87209] N86-15380
HYDROGEN SULFIDE
Novel sorbents for high temperature regenerative H2S removal
[NASA-CR-176449] N86-15360
HYDROLOGY
Water resources data for Ohio, water year 1984. Volume 2: St. Lawrence River Basin, statewide project data
[PB85-230233] N86-15719
Water resources data for California, water year 1983. Volume 3: Southern Central Valley Basins and the Great Basin from Walker River to Trucker River
[PB85-232312] N86-15720
Water resources data for Washington, water year 1982. Volume 2: Eastern Washington
[PB85-236834] N86-15721
Radionuclide Migration Project 1984
[DE85-017383] N86-16076
HYDROSTATIC PRESSURE
Effects of vibration-induced cavitation of physicochemical characteristics of aircraft fuel
N86-15346
HYDROSTATICS
Theoretical and experimental studies of baroclinic processes N86-15770
HYPERBOLIC DIFFERENTIAL EQUATIONS
Numerical methods for singularly perturbed differential equations with applications
[AD-A158969] N86-15997
HYPERFINE STRUCTURE
The parameters of adiabatic rapid passage in the 0-0 hyperfine transition of Rb-87
[AD-A158562] N86-16056
HYPERSONIC WIND TUNNELS
Hypersonic characteristics of an advanced aerospace plane at Mach 20.3
[NASA-TM-86435] N86-15245
HYPERVELOCITY FLOW
Quasi nonstretching hypervelocity jets
[ISL-CO-236/84] N86-15254
HYPERVELOCITY PROJECTILES
Damping of the rolling motion of full caliber fin-stabilized projectiles in supersonic flight
[ISL-CO-233/84] N86-15253
HYPOKINESIA
Investigation of some aspects of human amino acid metabolism during 120-day antiorthostatic hypokinesia
N86-15873
Effect of 7-day immersion hypokinesia on characteristics of precision movements N86-15874
Intensity of lipid peroxidation in hypokinetic rat tissues
N86-15876
Effect of 24,25-dihydroxyvitamin D3 on osteogenetic precursor cells in immobilized rats N86-15877
HYPOTHERMIA
Human thermoregulatory responses to cold air are altered by repeated cold water immersion
[AD-A158871] N86-15904
HYPOXEMIA
Advances in radiobiological research: Hypoxic irradiation effects N86-15894
HYPOXIA
Man's tolerance to fulminant form of hypoxic hypoxia
N86-15879

I

IBM COMPUTERS
Performance of various computers using standard linear equations software in a FORTRAN environment
[DE85-015336] N86-15974
ICE
Formulas concerning nonelectrical properties of snow: The electrical engineer's point of view
[REPT-S-156] N86-15715
ICE FORMATION
Results of icing flights in winter 1983/84: Ice accretion thickness in correlation with cloud physical parameters, object and cloud parameters
[DFVLR-FB-85-39] N86-15838
ICE REPORTING
Results of icing flights in winter 1983/84: Ice accretion thickness in correlation with cloud physical parameters, object and cloud parameters
[DFVLR-FB-85-39] N86-15838
IDENTITIES
A model of an expert computer vision and recognition facility with applications of a proportion technique
[AD-A158073] N86-15922
IGNITION
Calculating the vulnerability of synthetic polymers to autoignition during nuclear flash
[AD-A159420] N86-15399
IMAGE ANALYSIS
Pseudoinverse restoration of blurred image in uniform motion N86-15483
IMAGE CONVERTERS
Novel control circuit for proximity focused microchannel plate image intensifiers N86-15481
IMAGE CORRELATORS
Pseudoinverse restoration of blurred image in uniform motion N86-15483
IMAGE ENHANCEMENT
Flash X-ray with image enhancement applied to combustion events
[AD-A159328] N86-15369
Shift-variant multidimensional systems
[AD-A158973] N86-15998
IMAGE FILTERS
Lightning mapper and the future N86-15786
IMAGE INTENSIFIERS
Novel control circuit for proximity focused microchannel plate image intensifiers N86-15481

IMAGE PROCESSING
Visibility of noise in homogeneous and textured areas [FOA-C-50010-H2] N86-15536
Visual display parameters [AD-A158773] N86-15654
Computational models of human vision with applications [NASA-CR-176413] N86-15898
Binocular image flows: Steps toward stereo - motion fusion [AD-A158089] N86-15901
Demonstrate capabilities of digital graphics system to obtain quantitative information from flow visualization data [AD-A158760] N86-15923
Large memory acousto-optically addressed pattern recognition [AD-D011861] N86-16092
The detection of faint space object with solid state image detectors [AD-A158594] N86-16166
IMAGE RECONSTRUCTION
Shift-variant multidimensional systems [AD-A158973] N86-15998
IMAGE RESOLUTION
Real-time digital terrain image generator [AD-A159316] N86-15327
Visual display parameters [AD-A158773] N86-15654
IMAGE TUBES
Novel control circuit for proximity focused microchannel plate image intensifiers N86-15481
The detection of faint space object with solid state image detectors [AD-A158594] N86-16166
IMAGERY
Peat landforms along the Albany River, northern Ontario. An ecological study of peat landforms in Canada and Alaska [E86-10014] N86-15704
A comparison of LANDSAT TM to MSS imagery for detecting submerged aquatic vegetation in lower Chesapeake Bay N86-15707
Automated mesoscale winds derived from GOES multispectral imagery N86-15798
Satellite passive microwave rain measurement techniques for land and ocean N86-15799
IMAGING TECHNIQUES
Exact image method for impedance computation of antennas above the ground [REPT-S-161] N86-15535
Acoustical imaging system evaluation [AD-A159425] N86-15684
LANDSAT TM image data quality analysis for energy-related applications [E86-10009] N86-15703
LANDSAT-4 Thematic Mapper Modulation Transfer Function (MTF) evaluation [E86-10017] N86-15710
Systematic and random variations in digital Thematic Mapper data [E86-10018] N86-15711
Image registration N86-15718
Time composite sounding N86-15808
IMMOBILIZATION
Effect of 24,25-dihydroxyvitamin D3 on osteogenetic precursor cells in immobilized rats N86-15877
IMPACT ACCELERATION
Statistical research on problems of biodynamics [AD-A157993] N86-15899
IMPEDANCE
Scattering by cylinder with anisotropic impedance N86-15456
Experimental study of unidirectional ferrite microstrip lines N86-15500
Effect of antenna impedance mismatch on the signal-to-noise ratio of a radio receiving system [AD-A159070] N86-15525
IMPEDANCE MEASUREMENT
Exact image method for impedance computation of antennas above the ground [REPT-S-161] N86-15535
IMPINGEMENT
Textured carbon on copper: A novel surface with extremely low secondary electron emission characteristics [NASA-TP-2543] N86-15394
IMPLOSIONS
Alpha-burning in ICF target N86-16109
Target imposion in LIB ICF N86-16110
IMPROVEMENT
Analysis of satellite data for sensor improvement (detection of severe storms from space) N86-15796
IMPURITIES
Dynamics of recrystallization and redistribution of impurities in semiconductors exposed to millisecond laser radiation N86-15597
Functional state of the olfactory analyzer in a pressurized environment N86-15890
INDEXES (RATIOS)
Solution to reverse refraction problem N86-15562
INDIAN OCEAN
Remote sensing of severe convective storms N86-15800
INDIUM ARSENIDES
Characteristics of electrophysical and photoelectric properties of MOS-structures on indium arsenide N86-15486
Picosecond photoconductivity of indium aresenide N86-15596
INDIUM COMPOUNDS
Investigation of quantum effects in heterostructures [AD-A158327] N86-15550
INDUSTRIAL MANAGEMENT
Fiat to assemble efficient engine in automated plant N86-15679
INDUSTRIAL PLANTS
West Europe report: Science and technology [JPRS-WST-85-027] N86-15678
Fiat to assemble efficient engine in automated plant N86-15679
INDUSTRIAL WASTES
Determining probabilities of geologic events and processes [TI85-014642] N86-15762
INELASTIC SCATTERING
Spin dynamics of a Cu-Mn spin glass alloy [DE85-016295] N86-16134
INELASTIC STRESS
Nondestructive ultrasonic characterization of engineering materials [NASA-CR-176349] N86-15680
INEQUALITIES
On the matrix convexity of the Moore-Penrose inverse and some applications [AD-A158992] N86-16019
INERTIA
Response of the mesoscale atmosphere to diabatic heating N86-15794
INERTIAL CONFINEMENT FUSION
Transportable charge in a periodic alternating gradient system [DE85-015664] N86-16085
Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams [IPPJ-742] N86-16096
Pulse power transport to REB diode through slender MITL N86-16100
Alpha-burning in ICF target N86-16109
Research for thermal behavior of liquid-metal wall in ICF reactor N86-16111
Proposal of power plant by LIB fusion N86-16113
INFORMATION
A design evaluation checklist for user-system interface software [AD-A158599] N86-15954
INFORMATION DISSEMINATION
Call to expand information network for basic research N86-15475
The role of technical information in US competitiveness with Japan [GPO-51-564] N86-16152
EPIC/JANUS user's guide [DE85-017027] N86-16158
INFORMATION FLOW
Computer security policies [GPO-52-154] N86-15919
The role of technical information in US competitiveness with Japan [GPO-51-564] N86-16152
INFORMATION RETRIEVAL
A design study for a three-dimensional display computer terminal for meteorological information N86-15816
A computer model of case-based reasoning in problem solving: An investigation in the domain of dispute mediation [AD-A158097] N86-15912
Assurance Program for Remedial Action (APRA) microcomputer-operated bibliography management system [DE85-008763] N86-16155
SABIRS: User reference and system documentation [DE85-016801] N86-16157
Logical and physical database design with a full-text environment [DE85-015683] N86-16159
INFORMATION SYSTEMS
East Europe report: Science and technology [JPRS-ESA-85-033] N86-15473
Integrated Services Digital Network (ISDN) [AD-A159578] N86-15531
Managing computer systems development: Understanding the human and technological imperatives [AD-A158976] N86-15917
Using digital simulation in the design of CAMAC systems N86-15934
Automated flaw detection information-measuring system N86-15941
Programming productivity enhancement by the use of application generators by the use of application generators [AD-A158590] N86-15953
Implementation of multifunction information systems at three Navy facilities [AD-A157797] N86-16153
Queueing network systems with unbalanced flows and their applications to performance evaluation of highly parallel distributed information systems: Revision [AD-A158052] N86-16154
SABIRS: User reference and system documentation [DE85-016801] N86-16157
INFORMATION THEORY
Further informational properties of the Nash and Stackelberg solutions of LQG games [AD-A158569] N86-15993
INFRARED ASTRONOMY
BASD: SIRTF Telescope Instrument Changeout and Cryogen Replenishment (STICCR) study [NASA-CR-177381] N86-15334
INFRARED DETECTORS
Self-guarding Schottky barrier infrared detector array [AD-D011894] N86-15541
Theoretical model of Hg(1-x)Cd(x)Te photovoltaic and photoconductive infrared detectors [AD-A158668] N86-15551
INFRARED IMAGERY
Self-guarding Schottky barrier infrared detector array [AD-D011894] N86-15541
Estimation of precipitation from GOES IR imagery during FGGE: Application to diagnostic studies N86-15775
INFRARED RADIATION
Validation of outgoing longwave radiation in the GLAS (Goddard Laboratory for Atmospheric Sciences) general circulation model [AD-A158006] N86-15823
INFRARED SPECTRA
Ultimate limits of FT-IR [DE85-016442] N86-15652
INFRARED SPECTROSCOPY
The CO2 and CO abundances below 130 km altitude from infrared spectra [AERONOMICA-ACTA-A-296-1985] N86-15753
INGESTION (BIOLOGY)
Tritium ingestion in rats N86-15895
INJECTION
Predicting and diagnosing performance of transistors, integrated circuits and large-scale-integration systems by multilevel simulation methods and programs N86-15487
Transverse motion of high speed barium clouds in the ionosphere [AD-A159058] N86-15760
INORGANIC COMPOUNDS
USSR report: Chemistry [JPRS-UCH-85-013] N86-15344
INPUT
Bipolar digitizer having compression capability [AD-D011895] N86-15542
Input current shaped ac-to-dc converters [NASA-CR-176438] N86-15544
Variable radix processor [AD-D011893] N86-15918
INPUT/OUTPUT ROUTINES
Modeling problem-oriented multiprocessor systems N86-15932
An interactive discrete controls analysis option (ORACLS) for the CONTROLS analysis package on the IBM 3033 [AD-A158754] N86-15956
The revised report on Scheme or an uncommon Lisp [AD-A159423] N86-15963
INSECTS
Topical hazard evaluation program of Candidate Insect repellent AI3-35770 Hexahydro-1-((2-Methylcyclohexyl) Carbonyl)-1-H-Azepine [AD-A158386] N86-15903
INSPECTION
Demonstration of the in-field use of calorimetric assay for IAEA inspection purposes [DE85-016448] N86-16083

INTEGRAL EQUATIONS
Control and identification of time varying systems
[AD-A159067] N86-15999
INTEGRAL TRANSFORMATIONS
Backlund transformations: Tools to find novel integrable evolution equations
[PREPRINT-443] N86-16009
INTEGRALS
Residues of integrals with three-dimensional multipole singularities, with application to the Lagally theorem
[AD-A158771] N86-15995
Stochastic integrals and processes with independent increments
[AD-A158939] N86-16017
INTEGRATED CIRCUITS
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-009] N86-15452
Surface passivation of semiconductor circuit elements with layer of wideband semiconductor N86-15485
Predicting and diagnosing performance of transistors, integrated circuits and large-scale-integration systems by multilevel simulation methods and programs N86-15487
Methodology for determining dynamic characteristics of tristable-logic integrated circuits N86-15491
Reducing dynamic errors of integrated-circuit CMOS switches N86-15492
Pulse-type voltage stabilizer with integral pulse-width modulation N86-15505
Novel approaches to passivation of Si for VHSIC - based on fundamental studies
[AD-A158238] N86-15546
Silicon compiler design of combinational and pipeline adder integrated circuits
[AD-A158995] N86-15555
Standardization of Schwarz-Christoffel transformation for engineering design of semiconductor and hybrid integrated-circuit elements N86-15620
Monolithic cascade-type solar cells
[NASA-TM-77926] N86-15731
Variable radix processor
[AD-D011893] N86-15918
Procedures and general method for checking microprocessor malfunctions on the basis of pseudorandom testing sequences N86-15929
High-speed receivers of microprocessor signal conversion devices N86-15938
Integrated optoelectronic circuits utilizing InGaAsP grown by molecular beam epitaxy
[AD-A159403] N86-16129
Selective anodic oxidation of semiconductors for pattern generation
[AD-D011889] N86-16133
INTEGRATORS
Integrating sphere spectrometer for high-temperature materials characterization
[DE85-012170] N86-15656
INTELLIGENCE
Possibility of artificial intelligence in computers N86-15944
INTERATOMIC FORCES
Electronic structure of rare Earth metals and intermetallics
[DE85-015523] N86-16139
INTERDIGITAL TRANSDUCERS
Nonsinusoidal modes of oscillator with multifrequency surface-acoustic-wave resonator N86-15488
INTERFACES
Interface alignment system
[AD-D011896] N86-16087
INTERFACIAL TENSION
Droplet size and evaporation rate within a two-phase flow by morphology-dependent resonances in the optical spectra
[AD-A158931] N86-16091
INTERFERENCE DRAG
Aircraft Drag Prediction and Reduction
[AGARD-R-723] N86-15266
Parasitic and interference drag prediction and reduction N86-15272
INTERFERENCE FIT
Investigation of hologram analyzer with single-component optical hologram matching system N86-15507
INTERFERENCE GRATING
Reflection coefficient of harrow grating with conductor strips with respect to electromagnetic waves N86-15577
INTERFEROMETERS
Wavelength error analysis in a multiple-beam Fizeau laser wavemeter having a linear diode array readout
[NASA-TM-87614] N86-16089
INTERFEROMETRY
Athermal conditions of optical elements and properties of optical materials N86-15423
INTERIOR BALLISTICS
Flash X-ray with image enhancement applied to combustion events
[AD-A159328] N86-15369
Wave motion analysis of a nonspinning liquid filled cylinder
[AD-A159324] N86-15636
New experimental techniques for probing gun barrel boundary layers
[ISL-CO-234/84] N86-15640
Spectroscopic temperature measurements in interior ballistic environments
[ISL-CO-235/84] N86-15641
INTERNAL COMBUSTION ENGINES
Aircraft accident report: Vieques Air Link, Inc., Britten-Norman BN-21-6 Islander, N589SA, Vieques, Puerto Rico, August 2, 1984
[PB85-901408] N86-15276
INTERNAL PRESSURE
Probabilistic analysis of steel containment strength with internal pressure
[DE85-015520] N86-15389
INTERNAL WAVES
SAR (Synthetic Aperture Radar) data collection and processing summary - 1984 SARSEX (SAR internal wave signature experiment) experiment
[AD-A159440] N86-15530
Properties of the internal wave field on the equator N86-15839
INTERNATIONAL COOPERATION
Space activities of the United States, Soviet Union and other launching countries/organizations, 1957-1984
[GPO-46-504] N86-15330
East Europe report: Science and technology
[JPRS-ESA-85-031] N86-15893
The role of technical information in US competitiveness with Japan
[GPO-51-564] N86-16152
National Science Foundation authorization, 1986
[GPO-46-945] N86-16162
INTERPLANETARY MAGNETIC FIELDS
Solar-geophysical data number 486, February 1985. Part 1 (Prompt reports): Data for January 1985, December 1984 and late data
[PB85-196715] N86-16181
INTERPOLATION
Operational methods for data interpolation
[DE85-016050] N86-15969
INTERPROCESSOR COMMUNICATION
A research program in computer technology
[AD-A157991] N86-15920
Specific recommendations for improving network feedback to hosts
[AD-A158768] N86-15924
INTERSTITIALS
Statistical model for the trapping of interstitials by substitutional (interstitial) atoms in solids
[PREPRINT-442] N86-16141
INTERSYMBOLIC INTERFERENCE
Implementation of a serial delay insertion type loop communication for a real time multitransputer system
[AD-A158980] N86-15960
INTERVALS
On the number of bootstrap simulations required to construct a confidence interval
[AD-A158880] N86-16016
INVARIANCE
Adiabatic invariant value variation under shortwave band subcritical conditions N86-15572
Mathematical theory of holographic memory N86-15946
INVERSE SCATTERING
Nonlinear evolution equations associated with a Riemann-Hilbert scattering problem
[PREPRINT-458] N86-16030
The experimental investigation of the inverse problem in rough surface scattering of acoustic waves
[AD-A158070] N86-16044
INVERSIONS
A conceptual model of the severe-storm environment for inclusion into Air Weather Service severe-storm analysis and forecast procedures
[AD-A158010] N86-15824
A preliminary report on some recent results in born inversion
[AD-A158926] N86-15958
INVISCID FLOW
Test cases for inviscid flow field methods
[AGARD-AR-211] N86-15256
Objectives and scope of the Working Group 07 N86-15257
Prediction of the drag of wings at subsonic speeds by viscous/inviscid interaction techniques N86-15274
ION ACCELERATORS
IFA-2 collective ion accelerator experiments
[DE85-012358] N86-16067
ION BEAMS
MBE-4, a heavy ion multiple-beam experiment
[DE85-016626] N86-16064
Summary from Working Group on Multiple Beams and Funneling
[DE85-015694] N86-16065
IFA-2 collective ion accelerator experiments
[DE85-012358] N86-16067
Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams
[IPPJ-742] N86-16096
Investigation of diode physics using an annular magnetically insulated ion diode operated in long pulse mode N86-16097
Generation of ion beams in plasma focus N86-16102
Characteristics of intense pulsed ion beam extracted from dual-current-feed magnetically-insulated diode N86-16103
Time-resolved measurement of energy and species of an intense pulsed ion beam N86-16104
Operation at high voltage and power brightness of ion beam on conical pinched electron beam diode N86-16105
Simulation of ion-beam in MID N86-16107
Numerical analysis for current neutralization of rotating light ion beam N86-16108
Target imposion in LIB ICF N86-16110
Proposal of power plant by LIB fusion N86-16113
ION CURRENTS
Microstructures built from electroactive polymers: Toward a macromolecular electronics
[AD-A159430] N86-15400
ION EXCHANGING
Preparation and properties of transition metal beta aluminas
[AD-A159408] N86-16130
ION IMPLANTATION
Improved lifetime high voltage switch electrode
[AD-A158961] N86-15554
Fundamental studies and device development in beta silicon carbide
[AD-A159146] N86-16132
ION MICROSCOPES
Cryogenic sample stage for the CAMECA IMS-3F ion microscope
[AD-A158071] N86-15362
ION PLATING
TiN hard coating by reactive ion-plating
[BLL-RISLEY-TR-5112-(9091.9F)] N86-15371
ION SOURCES
Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams
[IPPJ-742] N86-16096
Experiments on cryogenic pulsed ion sources N86-16098
Magnetic insulation in an ion diode with toroidal magnetic field N86-16099
Simulation of ion-beam in MID N86-16107
ION TEMPERATURE
Cryogenic sample stage for the CAMECA IMS-3F ion microscope
[AD-A158071] N86-15362
IONIZATION
Mechanisms of excitation and ionization processes in sputtering
[AD-A158061] N86-15361
IONIZATION CHAMBERS
Dependence of charge collection distributions and dose on the gas type filling the ionization chamber for a p(66)Be(49) clinical neutron beam
[DE85-017366] N86-16117
IONIZED GASES
Dependence of charge collection distributions and dose on the gas type filling the ionization chamber for a p(66)Be(49) clinical neutron beam
[DE85-017366] N86-16117
IONIZING RADIATION
Measuring radiation electroconductivity of solid dielectrics exposed to pulsed ionizing radiation N86-15604
IONOSPHERE
Ionosphere influence on MHD wave bundle propagation N86-15570
Transverse motion of high speed barium clouds in the ionosphere
[AD-A159058] N86-15760
IONOSPHERIC DISTURBANCES
Solar-geophysical data number 486, February 1985. Part 1 (Prompt reports): Data for January 1985, December 1984 and late data
[PB85-196715] N86-16181

IONOSPHERIC F-SCATTER PROPAGATION
Project HERO: Heating Rocket Experiments. The H and E field probe (HESO): In situ measurements of plasma parameters in the ionospheric plasma modified by electromagnetic waves of high intensity
[BMFT-FB-W-85-009] N86-15766
IONOSPHERIC PROPAGATION
Local ionospheric irregularity effect on ELF radiowave propagation N86-15569
Adiabatic invariant value variation under shortwave band subcritical conditions N86-15572
IONS
Experimental studies of L shell X-ray emission from high density plasmas N86-16095
IRIDIUM
Structural examination of iridium-based single-crystal preparations
[DE85-017550] N86-16136
IRON
X-ray elastic constants and their meaning for Al and Fe
[AD-A158251] N86-15382
Investigation of the friction of Becorit 820 versus cast iron
[WB-83/TRI-10053] N86-15675
First-principles calculation of the magnetic properties of paramagnetic fcc iron
[DE85-017155] N86-16035
IRON ALLOYS
Creep rupture behavior of Stirling engine materials
[NASA-TM-87209] N86-15380
Microstructural evaluation of 49Co-49Fe-2V alloy
[DE85-016500] N86-15388
IRRADIATION
Time dependent rate theory for diffusional defect processes
[ORNL-6122] N86-15355
A cascade diffusion theory of sink capture fluctuations during irradiation of a solid
[ORNL-6123] N86-15356
New type of impurity defects in semiinsulating gallium aresenide N86-15595
Advances in radiobiological research: Hypoxic irradiation effects N86-15894
IRREVERSIBLE PROCESSES
Path integral approach to birth-death processes on a lattice
[NOTA-INTERNA-843] N86-16146
IRRITATION
Topical hazard evaluation program of Candidate Insect repellent AI3-35770 Hexahydro-1-((2-Methylcyclohexyl) Carbonyl)-1-H-Azepine
[AD-A158386] N86-15903
ISOLATION
Electrical characteristics of Si devices fabricated with completely consumed carbide (C3) dielectric isolation process
[AD-A158296] N86-15547
Completely consumed carbide (C3) - A new process for dielectric isolation
[AD-A158298] N86-15548
ISOSTATIC PRESSURE
Hot isostatic pressing of ceramics
[NASA-TM-77931] N86-15397
ISOTOPES
China report: Science and technology
[JPRS-CST-85-040] N86-15478
Tables of masses, binding energies, half-lives and natural abundances
[DE85-016344] N86-16061
Cosmogenic neutron-capture-produced nuclides in stony meteorites
[DE85-012689] N86-16170
ISOTOPIC LABELING
Capabilities, needs and applications of gaseous tracers
[DE85-015194] N86-15743
ISOTROPIC MEDIA
The Dowling wall pressure-spectrum analogy applied to an isotropic two-layered elastic medium
[AD-A158009] N86-15632
ITERATION
Boundary waves in finite antenna arrays N86-15455
One-dimensional iterative inversion of vertical seismic profiles N86-15748
Variance component estimation method for sparse matrix applications
[PB85-234383] N86-16011
ITERATIVE NETWORKS
Queueing network systems with unbalanced flows and their applications to performance evaluation of highly parallel distributed information systems: Revision
[AD-A158052] N86-16154
ITERATIVE SOLUTION
Pseudoinverse restoration of blurred image in uniform motion N86-15483

J

JAMMERS
The design of a Rotman lens
[FEL-1985-13] N86-15537
JAPAN
Geophysical Bulletin of Hokkaido University, no. 46
[ISSN-0439-3503] N86-15695
Observations on the atmospheric electrical environment of sea fog in the Pacific Coast of Eastern Hokkaido, Japan N86-15697
A numerical simulation of coastal mixed layer by a modified 1-D DKT model N86-15700
A study of the strong ground motion of the western Hidaka, Hokkaido earthquake N86-15701
Seismic intensity survey and hypocenter recalculation on the 1985 Sapporo earthquake (M 3.5) N86-15702
The role of technical information in US competitiveness with Japan
[GPO-51-564] N86-16152
JET ENGINE FUELS
Evaluating structural changes in jet fuels by electrical conductivity and viscosity N86-15345
Effects of vibration-induced cavitation of physicochemical characteristics of aircraft fuel N86-15346
Antimisting kerosene: Development of a continuous 10 GPM in-line blender
[NASA-CR-176432] N86-15412
Variability of major organic components in aircraft fuels
[AD-A159057] N86-15415
Fuel effects on soot formation in turbojet engines
[AD-A159073] N86-15416
JET ENGINES
An analysis of cross-coupling of a multicomponent jet engine test stand using finite element modeling techniques
[NASA-CR-176424] N86-15323
JET FLOW
Quasi nonstretching hypervelocity jets
[ISL-CO-236/84] N86-15254
JET IMPINGEMENT
Heat transfer characteristics within an array of impinging jets. Effects of crossflow temperature relative to jet temperature
[NASA-CR-3936] N86-15625
JET STREAMS (METEOROLOGY)
Mesoscale ageostrophic circulations associated with baroclinic jet streaks N86-15795
JOINTS (JUNCTIONS)
Concepts for the development of a nondestructive testing and evaluation system for rigid airfield pavements
[AD-A158004] N86-15324
Thermal-mechanical fatigue test apparatus for metal matrix composites and joint attachments
[NASA-TM-87187] N86-15378
Effects of load proportioning on the capacity of multiple-hole composite joints
[NASA-CR-178019] N86-15687
A perturbation approach to robot calibration
[AD-A159166] N86-16004
JOSEPHSON JUNCTIONS
Sensitivity of squids built with low-capacitance Josephson tunnel junctions N86-15617
Maximum attainable sensitivity of dc squids built with Josephson tunnel junctions N86-15619

K

KALMAN FILTERS
A brief investigation of adaptive decision feedback equalization for digital HF links employing PSK (Phase Shift Keying) modulation
[AD-A157809] N86-15545
Further informational properties of the Nash and Stackelberg solutions of LQG games
[AD-A158569] N86-15993
KAON PRODUCTION
Search for the Xi(2220) at Lear
[DE85-014329] N86-16070
KAONS
Search for the Xi(2220) at Lear
[DE85-014329] N86-16070
KELVIN-HELMHOLTZ INSTABILITY
Observations of equatorially trapped waves in the eastern Atlantic Ocean from inverted echo sounders N86-15840
KEROSENE
Evaluating structural changes in jet fuels by electrical conductivity and viscosity N86-15345
Antimisting kerosene: Development of a continuous 10 GPM in-line blender
[NASA-CR-176432] N86-15412
KEYING
A study of data entry keyboards: The 4 x 4 keypad
[AD-A159095] N86-15926
KINEMATICS
An experimental study of an ultra-mobile vehicle for off-road transportation. Appendix 2. Dissertation. Kinematic optimal design of a six-legged walking machine
[AD-A159147] N86-15434
Effects of waves on the boundary layer of a surface-piercing body
[AD-A158053] N86-15633
Steady state penetration of rigid perfectly plastic targets
[AD-A158081] N86-15670
KINETIC ENERGY
Response of the mesoscale atmosphere to diabatic heating N86-15794
A summary of research on mesoscale energetics of severe storm environments N86-15807
KINETIC EQUATIONS
Stimulated emission of bounded strong-current electron beam with longitudinal magnetic field magnetostatic pumping N86-15591
KINETICS
New type of impurity defects in semiinsulating gallium aresenide N86-15595
Analysis of dislocation kinetics across shocks
[DE85-016444] N86-15638
KNUDSEN FLOW
PETROS: A progam for calculating transport of heat, water, water vapor and air through a porous material
[DE85-013168] N86-15972
KRYPTON
Experimental studies of L shell X-ray emission from high density plasmas N86-16095

L

LABORATORIES
United States Air Force Academy, Department of Chemistry Research: AY 1983-1984
[AD-A159319] N86-15343
LAMINAR BOUNDARY LAYER
Laminar flow control with suction: Theory and experiment N86-15269
Design considerations for application of laminar flow control systems to transport aircraft N86-15270
Numerical study of the laminar shock boundary layer interaction
[DFVLR-FB-85-34] N86-15642
LAMINAR FLOW
Aircraft Drag Prediction and Reduction
[AGARD-R-723] N86-15266
Aircraft drag reduction technology: A summary N86-15267
F-111 natural laminar flow glove flight test data analysis and boundary layer stability analysis
[NASA-CR-166051] N86-15305
Catalytic surface effects on contaminated space shuttle tile in a dissociated nitrogen stream
[NASA-TM-86770] N86-15335
Effects of waves on the boundary layer of a surface-piercing body
[AD-A158053] N86-15633
LAMINATES
Effect of stress concentrations in composite structures
[NASA-CR-176410] N86-15348
Stress concentration around a small circular hole in the HiMAT composite plate
[NASA-TM-86038] N86-15350
Elastic bearing
[AD-A159140] N86-15672
LAND
Satellite passive microwave rain measurement techniques for land and ocean N86-15799
LANDING GEAR
Nonlinear dynamics of a helicopter model in ground resonance N86-15284
LANDSAT SATELLITES
LANDSAT TM image data quality analysis for energy-related applications
[E86-10009] N86-15703
Evaluation of spatial, radiometric and spectral Thematic Mapper performance for coastal studies
[E86-10016] N86-15706
A comparison of LANDSAT TM to MSS imagery for detecting submerged aquatic vegetation in lower Chesapeake Bay N86-15707
LANGUAGE PROGRAMMING
An implementation in Pascal: Translation of Prolog into Pascal
[AD-A159552] N86-15965

LAPLACE TRANSFORMATION
LaPlace transformation with REDUCE 2
[INPE-3649-PRE/816] N86-15985
LARGE SCALE INTEGRATION
Predicting and diagnosing performance of transistors, integrated circuits and large-scale-integration systems by multilevel simulation methods and programs N86-15487
Design of differential circuit for LSI N-threshold comparator N86-15583
Procedures and general method for checking microprocessor malfunctions on the basis of pseudorandom testing sequences N86-15929
High-speed receivers of microprocessor signal conversion devices N86-15938
LASER APPLICATIONS
FRG turns efforts to laser development N86-15436
Laser technology in manufacture of printed-circuit boards N86-15469
Rate of widening of strong-field domain in supercritically doped Gunn-effect devices N86-15589
Dynamics of recrystallization and redistribution of impurities in semiconductors exposed to millisecond laser radiation N86-15597
LASER DOPPLER VELOCIMETERS
West Europe report: Science and technology
[JPRS-WST-85-024] N86-15447
FRG uses laser for non-destructive testing in wind canal N86-15451
Study of high speed combustion flows by laser velocimetry
[NASA-CR-176439] N86-15668
Wavelength error analysis in a multiple-beam Fizeau laser wavemeter having a linear diode array readout
[NASA-TM-87614] N86-16089
LASER GUIDANCE
Investigations of laser initiated discharge channels
[AD-A158872] N86-15660
LASER INTERFEROMETRY
Droplet sizing research
[AD-A158318] N86-15653
LASER MATERIALS
Delay effect in pulsed avalanche discharge of an XeCl laser at high gas pressure N86-15482
LASER OUTPUTS
Structural transformations in semiconductors during optical pumping N86-15490
Development of a photonic data recorder
[DE85-017120] N86-15655
Angular-gain spectrum of free electron lasers
[AD-A159412] N86-15665
Subnanosecond short wavelength generation using optical fibers
[AD-A158769] N86-16090
Plasma heating effects during laser welding
[DE85-010776] N86-16119
LASER PLASMAS
Laser produced plasma affects on welding
[DE85-009638] N86-16118
Plasma heating effects during laser welding
[DE85-010776] N86-16119
Laser intracavity absorption as a plasma diagnostic aid
[DE85-015741] N86-16120
LASER PUMPING
High-power sources with smoothly adjustable pulse duration for powering gas-discharge tubes of laser pumping systems N86-15498
High-power pulse generator with pulseform control for powering gas-discharge tubes of laser pumping systems N86-15499
LASER SPECTROSCOPY
Spectroscopic temperature measurements in interior ballistic environments
[ISL-CO-235/84] N86-15641
LASER WELDING
Fracture toughness testing of laser welds in 2 mm thick titanium alloy IMI 550
[REPT-3784/1/85] N86-15685
Laser produced plasma affects on welding
[DE85-009638] N86-16118
Plasma heating effects during laser welding
[DE85-010776] N86-16119
LASERS
New type of impurity defects in semiinsulating gallium aresenide N86-15595
Laser plus surface-dynamics facility
[AD-A158922] N86-15661
Modal analysis of unstable resonators
[AD-A159225] N86-15663
LATERAL CONTROL
Damping of the rolling motion of full caliber fin-stabilized projectiles in supersonic flight
[ISL-CO-233/84] N86-15253
Use of hinged strakes for lateral control at high angles of attack
[AD-A158005] N86-15321
LATERAL STABILITY
Hypersonic characteristics of an advanced aerospace plane at Mach 20.3
[NASA-TM-86435] N86-15245
LATTICE PARAMETERS
Self-consistent electronic structure of alpha-phase Hume-Rothery electron compound
[DE85-017560] N86-16080
Corrections to universal scaling for the 2D nonlinear sigma model on the lattice
[PREPRINT-460] N86-16145
Path integral approach to birth-death processes on a lattice
[NOTA-INTERNA-843] N86-16146
LATTICE VIBRATIONS
Superlattice optical bistability research
[AD-A158876] N86-16128
LC CIRCUITS
Input current shaped ac-to-dc converters
[NASA-CR-176438] N86-15544
LEAD (METAL)
Thin superconducting film characterization by surface acoustic waves
[AD-A158311] N86-16127
LEADING EDGE FLAPS
Use of hinged strakes for lateral control at high angles of attack
[AD-A158005] N86-15321
LEADING EDGES
Design considerations for application of laminar flow control systems to transport aircraft N86-15270
LEAST SQUARES METHOD
Analysis of drops in accuracy of least-squares approximation N86-15428
Profile fitting in residual stress determination
[AD-A158881] N86-15691
Variance component estimation method for sparse matrix applications
[PB85-234383] N86-16011
Degenerate multivariate stationary processes: Basicity, past and future, and autoregressive representation
[AD-A158879] N86-16015
LEATHER
East Europe report: Science and technology
[JPRS-ESA-85-037] N86-15408
Use of new polyurethane in leather substitute N86-15410
LECTURES
The Earth's atmosphere: Ideas old and new
[AD-A159558] N86-15828
LEG (ANATOMY)
An experimental study of an ultra-mobile vehicle for off-road transportation. Appendix 2. Dissertation. Kinematic optimal design of a six-legged walking machine
[AD-A159147] N86-15434
LEGENDRE FUNCTIONS
Analysis of drops in accuracy of least-squares approximation N86-15428
LENGTH
Measuring the orbit length of the Tevatron
[DE85-017443] N86-16079
LENS ANTENNAS
The design of a Rotman lens
[FEL-1985-13] N86-15537
LENSES
Finite-difference electrodynamic analysis of a tapering coaxial waveguide incorporating a dielectric wedge-shaped lens for concentrating Transverse Electromagnetic (TEM) waves
[SAND-84-2062] N86-15517
Determination of point source image field structure by real radiooptical antenna N86-15564
LEPTONS
Does one need a fourth generation of leptons
[PREPRINT-461] N86-16071
LETHALITY
Significance of single particle effects in neutral beam weapon lethality
[DE85-012031] N86-16068
LEVEL (HORIZONTAL)
Development of slope spectra of the wind-disturbed water surface N86-15842
LIBRARIES
Microcomputer networking in libraries. Report of a study visit to the United States 14th October 1983
[BLRDR-5819] N86-15976
Code developer's guide to the Styx Liaison Library: A software interface for accessing and manipulating Styx opacity data
[DE85-014253] N86-16160
Vitamin-E 174N,38G general purpose cross-section library
[DE85-013110] N86-16161
LIE GROUPS
On the optimal control of bilinear systems and its relation to Lie algebras
[RR-275] N86-15980
LIFE CYCLE COSTS
System engineering and energy cost analysis of small and medium wind turbines
[DE85-012159] N86-15738
LIFE SUPPORT SYSTEMS
Investigation of distinctions referable to growth, development and metabolism of Closteriopsis acicularis algae when cells are limited in nitrogen as related to biological life-support systems for man N86-15883
Investigation of mineral nutrition of a new form of microalgae to be used in biological life-support systems N86-15892
LIFT
Lifting surface theory for a helicopter rotor in forward flight N86-15287
Prediction of wing aeroelastic effects on aircraft lift and pitching moment characteristics
[NASA-TM-87631] N86-15319
Ferromagnetic resonance probe liftoff suppression apparatus
[AD-D011913] N86-15647
LIFTING BODIES
Lifting surface theory for a helicopter rotor in forward flight N86-15287
LIGHT AIRCRAFT
Light helicopter family trade-off analysis. Volume 4: Appendix N
[AD-A158075] N86-15306
Light helicopter family trade-off analysis. Volume 8: Appendices S and T
[AD-A158077] N86-15308
LIGHT EMISSION
Optical emission line monitor with background observation and cancellation
[DE85-017745] N86-15370
GDR scientists develop electroluminescence display N86-15476
Mathematical theory of holographic memory N86-15948
LIGHT EMITTING DIODES
Advances in optoelectronic, nuclear reactor, radiobiological research: High voltage optocoupler N86-15896
LIGHT IONS
Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams
[IPPJ-742] N86-16096
Simulation of ion-beam in MID N86-16107
Numerical analysis for current neutralization of rotating light ion beam N86-16108
Target imposion in LIB ICF N86-16110
Proposal of power plant by LIB fusion N86-16113
LIGHT SOURCES
Plasmas as light sources for lasers
[AD-A159460] N86-15666
LIGHTNING
Mathematical modeling of main lightning stage N86-15503
Mobile intercept of storms N86-15771
Application of satellite data to tropic/subtropic moisture coupling N86-15780
Deep convection in mesoscale convective systems N86-15782
Severe storm electricity N86-15783
Storm severity detection (RF) N86-15784
Studies of lightning data in conjunction with geostationary satellite data N86-15785
Lightning mapper and the future N86-15786
Space shuttle/mesoscale lightning experiment N86-15787
Optical characteristics of lightning and thunderstorm currents N86-15788
Optical characteristics of lightning N86-15789
Airborne atmospheric electricity experiments N86-15790
A synoptic and mesoscale study of a frequent lightning event
[AD-A158225] N86-15825
LIMITS (MATHEMATICS)
Mathematical problems in stability, control and reliability of random access communication systems
[AD-A159402] N86-15529
LINE SPECTRA
Multi-color X-ray line source
[AD-D011910] N86-16088

LINEAR ACCELERATORS
Improving neutron reaction data through linac-based flight-time spectrometry
[DE85-016417] N86-16062
MBE-4, a heavy ion multiple-beam experiment
[DE85-016626] N86-16064
Summary from Working Group on Multiple Beams and Funneling
[DE85-015694] N86-16065
Superconducting linacs: Some recent developments
[DE85-014972] N86-16081
Isolated data acquisition system for high voltage applications
[DE85-016984] N86-16116
Superconducting resonators for the University of Washington booster linac
[DE85-017419] N86-16124
Possibilities at LAMPF for studying nuclei of astrophysical interest
[DE85-017526] N86-16173

LINEAR ARRAYS
Radiation pattern and reduced gain of linear antenna in turbulent anisotropic atmosphere N86-15464
The design of a Rotman lens
[FEL-1985-13] N86-15537

LINEAR ENERGY TRANSFER (LET)
Radiation mapping on Spacelab 1: Experiment no. INS006
[NASA-CR-171893] N86-15332

LINEAR EQUATIONS
Performance of various computers using standard linear equations software in a FORTRAN environment
[DE85-015338] N86-15974
A new enumeration scheme for the knapsack problem
[INPE-3563-PRE/769] N86-15983

LINEAR EVOLUTION EQUATIONS
Backlund transformations: Tools to find novel integrable evolution equations
[PREPRINT-443] N86-16009

LINEAR PROGRAMMING
A computer model of driver response
[UTIAS-293] N86-15911
Performance of various computers using standard linear equations software in a FORTRAN environment
[DE85-015338] N86-15974

LINEAR SYSTEMS
Modal analysis of unstable resonators
[AD-A159225] N86-15663
An interactive discrete controls analysis option (ORACLS) for the CONTROLS analysis package on the IBM 3033
[AD-A158754] N86-15956
On the optimal control of bilinear systems and its relation to Lie algebras
[RR-275] N86-15980
Research in applied mathematics related to nonlinear system theory
[AD-A158330] N86-16027
Wavelength error analysis in a multiple-beam Fizeau laser wavemeter having a linear diode array readout
[NASA-TM-87614] N86-16089

LINEARITY
Mesoscale: Cloud scale simulation of convective response N86-15802
Shift-variant multidimensional systems
[AD-A158973] N86-15998
On determining the predictor of Non-Full-Rank multivariate stationary random processes
[AD-A159165] N86-16024

LININGS
Acoustical imaging system evaluation
[AD-A159425] N86-15684

LIOUVILLE EQUATIONS
Radiation pressure and the geocorona N86-15749

LIOUVILLE THEOREM
Three families of integrable one-particle potentials
[PREPRINT-440] N86-16007

LIPID METABOLISM
Effect of level of physical activity on lipid metabolism of flight personnel N86-15871

LIPIDS
Intensity of lipid peroxidation in hypokinetic rat tissues N86-15876
Gas chromatographic analysis of free fatty acids of skin surface lipids N86-15891

LIQUEFIED GASES
Solar rocket absorber
[AD-D011897] N86-15336

LIQUID FILLED SHELLS
Wave motion analysis of a nonspinning liquid filled cylinder
[AD-A159324] N86-15636

LIQUID FLOW
Approach to uncertainty assessment for fluid flow and contaminant transport modeling in heterogeneous groundwater systems
[DE85-016621] N86-15714

LIQUID FUELS
Droplet size and evaporation rate within a two-phase flow by morphology-dependent resonances in the optical spectra
[AD-A158931] N86-16091

LIQUID HELIUM
BASD: SIRTF Telescope Instrument Changeout and Cryogen Replenishment (STICCR) study
[NASA-CR-177381] N86-15334

LIQUID HYDROGEN
Creep rupture behavior of Stirling engine materials
[NASA-TM-87209] N86-15380

LIQUID METAL COOLED REACTORS
Research for thermal behavior of liquid-metal wall in ICF reactor N86-16111

LIQUID ROCKET PROPELLANTS
Solar rocket absorber
[AD-D011897] N86-15336

LIQUIDS
The movement of a cluster of particles subject to the effect of gravity and their sedimentation onto a plane horizontal surface
[BLL-RISLEY-TR-5161-(9091.9F)] N86-15623

LITHIUM
Laser intracavity absorption as a plasma diagnostic aid
[DE85-015741] N86-16120

LITHIUM COMPOUNDS
Heterogeneous response of aluminum and lithium niobate to shock waves
[DE85-013963] N86-16140

LITHOLOGY
Paleomagnetism and tectonics of the central and eastern Transverse Ranges, Southern California N86-15747

LOAD DISTRIBUTION (FORCES)
Limit analysis of transversely loaded grillages
[AD-A158988] N86-15692

LOAD TESTS
Digital servocontroller system. Volume 2. Maintenance manual
[AD-A159066] N86-15322

LOADING MOMENTS
The experimental determination of the subsonic aerodynamic characteristics of an Ogive-Cylinder body including a comparison with theoretical estimates, volume 1
[CAR-8509] N86-15242
Power combinations microwave amplifier loading characteristics N86-15610
Limit analysis of transversely loaded grillages
[AD-A158988] N86-15692

LOADING RATE
Modeling of concrete, soil, and interfaces
[AD-A158062] N86-15432

LOADS (FORCES)
An examination of the relations between rotor vibratory loads and airframe vibrations N86-15299
Analysis of potential helicopter vibration reduction concepts N86-15302
Adaptation of a modern medium helicopter (Sikorsky S-76) to higher harmonic control N86-15303
Evaluation of a load cell model for dynamic calibration of the rotor systems research aircraft N86-15304
Digital servocontroller system. Volume 2. Maintenance manual
[AD-A159066] N86-15322
Effects of load proportioning on the capacity of multiple-hole composite joints
[NASA-CR-178019] N86-15687

LOG PERIODIC ANTENNAS
Synthesis of log-periodic antennas with prescribed geometry N86-15454
Matrix analysis of periodic interleaved multifrequency antenna arrays N86-15457

LOGIC CIRCUITS
Variable radix processor
[AD-D011893] N86-15918

LOGIC DESIGN
Methodology for determining dynamic characteristics of tristable-logic integrated circuits N86-15491
The LOGLISP programming system
[AD-A158011] N86-15950

LOGIC PROGRAMMING
An implementation in Pascal: Translation of Prolog into Pascal
[AD-A159552] N86-15965

LOGISTICS
A general model for the homogeneous case of the continuous response
[AD-A159345] N86-15914
Multiple decision procedures for Tukey's generalized lambda distributions
[AD-A159153] N86-16021

LONG ISLAND (NY)
Structure and tectonics of the Long Island platform N86-15752

LONG TERM EFFECTS
Basic results of experiments with long-term rotation of rats as applied to the problem of artificial gravity N86-15878

LONGITUDINAL STABILITY
Hypersonic characteristics of an advanced aerospace plane at Mach 20.3
[NASA-TM-86435] N86-15245

LOOPS
Digital servocontroller system. Volume 2. Maintenance manual
[AD-A159066] N86-15322
Implementation of a serial delay insertion type loop communication for a real time multitransputer system
[AD-A158980] N86-15960
Power combiners/dividers for loop pickup and kicker arrays FNAL stochastic cooling rings
[DE85-016562] N86-16121

LOSSY MEDIA
Maximum antenna power reception in lossy medium N86-15563

LOW DENSITY RESEARCH
Numerical analysis for current neutralization of rotating light ion beam N86-16108

LOW FREQUENCIES
Local ionospheric irregularity effect on ELF radiowave propagation N86-15569
Seismic moment tensor recovery at low frequencies N86-15750

LOW PRESSURE
Melting and consolidation of nickel alloy powders with a plasma jet operating in a low pressure inert environment N86-15374

LOW TEMPERATURE ENVIRONMENTS
Design of foundations in permafrost
[AD-A158063] N86-15433

LOW VOLTAGE
Reducing dynamic errors of integrated-circuit CMOS switches N86-15492

LUMINANCE
Visibility of noise in homogeneous and textured areas
[FOA-C-50010-H2] N86-15536
Visual display parameters
[AD-A158773] N86-15654

LUMINESCENCE
Micron-spaced platinum interdigitated array electrode: Fabrication, theory and initial use
[AD-A159429] N86-15556
Luminescence photography N86-15582

LUNAR BASES
Environmental considerations and waste planning on the lunar surface: An interactive qualifying N86-15331

LUNAR ENVIRONMENT
Environmental considerations and waste planning on the lunar surface: An interactive qualifying N86-15331

M

MACH NUMBER
Hypersonic characteristics of an advanced aerospace plane at Mach 20.3
[NASA-TM-86435] N86-15245
Fundamental study of flow field generated by rotorcraft blades using wide-field shadowgraph
[NASA-CR-176443] N86-15249
F-111 natural laminar flow glove flight test data analysis and boundary layer stability analysis
[NASA-CR-166051] N86-15305

MACHINE TOOLS
Machine with an intermittently rotating table for the performance of work operations
[AD-D011911] N86-15669

MAGNESIUM
Corrosion resistant magnesium-based materials for naval applications
[AD-A158012] N86-15351

MAGNETIC FIELD CONFIGURATIONS
Optimization of a magnet circuit design for a cylindrical mass spectrometer
[NASA-CR-176400] N86-15543
Effect of conductor profile on force characteristics due to motion of a magnetic field source N86-15607
Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams
[IPPJ-742] N86-16096
Magnetic insulation in an ion diode with toroidal magnetic field N86-16099

MAGNETIC FIELDS
China reaches new level in minicomputer development N86-15440
Active magnetic suspension in main magnetic field of electric motor N86-15502
Determination of electromagnetic forces in magnetic field calculations N86-15504
Novel transport and recombination processes in semiconductors
[AD-A158321] N86-15549
Modulation instability and solitons of electromagnetic wave envelopes in ferromagnetic semiconductors N86-15578
Rate of widening of strong-field domain in supercritically doped Gunn-effect devices N86-15589
Stimulated emission of bounded strong-current electron beam with longitudinal magnetic field magnetostatic pumping N86-15591
Properties of the internal wave field on the equator N86-15839
Research and development of an aimed magnetic lead current density-magnetic field diagnostic
[DE85-014720] N86-16060
Pulse power transport to REB diode through slender MITL N86-16100
Characteristics of intense pulsed ion beam extracted from dual-current-feed magnetically-insulated diode N86-16103
Thin superconducting film characterization by surface acoustic waves
[AD-A158311] N86-16127
MAGNETIC FLUX
Effect of conductor profile on force characteristics due to motion of a magnetic field source N86-15607
Maximum attainable sensitivity of dc squids built with Josephson tunnel junctions N86-15619
MAGNETIC INDUCTION
Determination of electromagnetic forces in magnetic field calculations N86-15504
MAGNETIC MEASUREMENT
The IOS geophysical data held on magnetic tape - summary. Bathymetric, magnetic and gravity data collected during marine geology and geophysics cruises 1973 - 1984
[IOS-194] N86-15852
MAGNETIC MOMENTS
First-principles calculation of the magnetic properties of paramagnetic fcc iron
[DE85-017155] N86-16035
MAGNETIC PROPERTIES
Electronic structure of rare Earth metals and intermetallics
[DE85-015523] N86-16139
MAGNETIC RECORDING
Digital methods of recording color television images on film tape N86-15579
MAGNETIC SUSPENSION
Active magnetic suspension in main magnetic field of electric motor N86-15502
MAGNETIC TAPES
Digital methods of recording color television images on film tape N86-15579
MAGNETOHYDRODYNAMIC STABILITY
Magnetohydrodynamic stability of sphereomak plasma in toroidal flux conserver with rectangular cross section. Part 2: Application of Mercier criterion
[IPPJ-743] N86-16114
MAGNETOHYDRODYNAMIC TURBULENCE
Theoretical and experimental studies in support of the Geophysical Fluid Flow Experiment N86-15772
MAGNETOHYDRODYNAMIC WAVES
Ionosphere influence on MHD wave bundle propagation N86-15570
MAGNETOSPHERE
The charge-state composition of 0.4-MeV helium ions in Earth's outer radiation belts during quiet times
[AD-A147561] N86-15757
MAGNETOSTATICS
Experimental study of magnetostatic wave propagation through film waveguides N86-15565
Stimulated emission of bounded strong-current electron beam with longitudinal magnetic field magnetostatic pumping N86-15591
MAGNETS
Pulsed septum magnet for the Fermilab antiproton source
[DE85-016993] N86-16078
MAINTENANCE
Repair, evaluation, maintenance, and rehabilitation research program. The condition of Corps of Engineers civil works concrete structures
[AD-A157992] N86-15430
MALFUNCTIONS
Procedures and general method for checking microprocessor malfunctions on the basis of pseudorandom testing sequences N86-15929
MAN MACHINE SYSTEMS
A computer model of driver response
[UTIAS-293] N86-15911
On looking into the black box: Prospects and limits in the search for mental models
[AD-A159080] N86-15913
A research program in computer technology
[AD-A157991] N86-15920
MANAGEMENT INFORMATION SYSTEMS
Managing computer systems development: Understanding the human and technological imperatives
[AD-A158976] N86-15917
MANAGEMENT PLANNING
Considerations for the design and implementation of a management support system for the Electronic Warfare System Support Laboratory
[AD-A158978] N86-15325
MANAGEMENT SYSTEMS
Considerations for the design and implementation of a management support system for the Electronic Warfare System Support Laboratory
[AD-A158978] N86-15325
Belorussian computer speaks, reads graphics, X-rays N86-15945
SABIRS: User reference and system documentation
[DE85-016801] N86-16157
MANIPULATORS
A perturbation approach to robot calibration
[AD-A159166] N86-16004
MANNED SPACE FLIGHT
Space activities of the United States, Soviet Union and other launching countries/organizations, 1957-1984
[GPO-46-504] N86-15330
West Europe report: Science and technology
[JPRS-WST-85-015] N86-15443
Speed of Hermes to give Europeans space access, Ducrocq says N86-15445
MANNED SPACECRAFT
West Europe report: Science and technology
[JPRS-WST-85-015] N86-15443
Speed of Hermes to give Europeans space access, Ducrocq says N86-15445
MANUFACTURING
Laser technology in manufacture of printed-circuit boards N86-15469
Call to expand information network for basic research N86-15475
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-006] N86-15561
Fiat to assemble efficient engine in automated plant N86-15679
Ceramic automotive Stirling engine study
[NASA-CR-174907] N86-16165
MAPPING
Computer vision research and its applications to automated cartography
[AD-A159435] N86-15713
Structure and tectonics of the Long Island platform N86-15752
Severe storm electricity N86-15783
Lightning mapper and the future N86-15786
Multispectral atmospheric mapping sensor of mesoscale water vapor features N86-15819
Demonstrate capabilities of digital graphics system to obtain quantitative information from flow visualization data
[AD-A158760] N86-15923
MARINE BIOLOGY
A review of biological processes within oceanic water columns relevant to the assessment of the safety of disposal of waste, notably radioactive isotopes, on or within the seabed
[IOS-198] N86-15745
MARINE ENVIRONMENTS
Airborne Doppler measurements of the central California extended sea breeze N86-15791
Single station assessment of atmospheric boundary layer properties in the eastern Mediterranean Sea
[AD-A159432] N86-15827
Teh carbon dioxide system and its role on trace metal chemistry in the marine environment N86-15843
MARINE TECHNOLOGY
Hydrodynamic noise and surface compliance--an overview of the Naval Underwater Systems Center IR/IED program
[AD-A157799] N86-15630
MARSHLANDS
Peat landforms along the Albany River, northern Ontario. An ecological study of peat landforms in Canada and Alaska
[E86-10014] N86-15704
Remote sensing of coastal wetlands biomass using Thematic Mapper wavebands N86-15709
MARTENSITE
Mechanical properties and deformation behavior of martensite-ferrite dual-phase steels N86-15373
The role of microstructure in hydrogen-assisted crack initiation in high strength steels N86-15375
MARTINGALES
Stochastic integration for operator valued processes on Hilbert spaces and on nuclear spaces
[AD-A158878] N86-16014
MASS FLOW
Droplet sizing research
[AD-A158318] N86-15653
Airborne Doppler measurements of the central California extended sea breeze N86-15791
MASS FLOW RATE
Results of wind tunnel tests on external combustion
[DFVLR-FB-85-35] N86-15643
MASS SPECTROMETERS
Optimization of a magnet circuit design for a cylindrical mass spectrometer
[NASA-CR-176400] N86-15543
MASS SPECTROSCOPY
Fundamental studies and device development in beta silicon carbide
[AD-A159446] N86-16132
MASS TRANSFER
Recurrent population 2 X-ray transients - similarities to SU UMa cataclysmic variables
[DE85-014075] N86-16184
MATCHED FILTERS
Large memory acousto-optically addressed pattern recognition
[AD-D011861] N86-16092
MATCHING
Effect of antenna impedance mismatch on the signal-to-noise ratio of a radio receiving system
[AD-A159070] N86-15525
Constructing a perfect matching is in Random NC
[AD-A157813] N86-15988
MATERIALS HANDLING
Scientists cite uses of cryogenics, low temperature measurement N86-15477
MATERIALS SCIENCE
Congressional Workshop on Advanced Materials Research and Development
[GPO-47-717] N86-15340
MATHEMATICAL MODELS
Test cases for inviscid flow field methods
[AGARD-AR-211] N86-15256
Ground resonance analysis using a substructure modeling approach N86-15282
A cascade diffusion theory of sink capture fluctuations during irradiation of a solid
[ORNL-6123] N86-15356
Chemoviscosity modeling for thermosetting resins
[NASA-CR-176409] N86-15395
Multi-dimensional combustion instability analysis of solid propellant rocket motors
[AD-A158314] N86-15414
Mathematical modeling of main lightning stage N86-15503
Statistical characteristics of ultrashort-wave signal fast phase fluctuations based on amplitude measurements on sea lanes N86-15566
Numerical simulation of viscous supersonic flow over a generic fighter configuration
[NASA-TM-86823] N86-15627
Theoretical studies of two-dimensional effects in free electron lasers
[AD-A158229] N86-15659
Modal analysis of unstable resonators
[AD-A159225] N86-15663
Static and dynamic material model for elastohydrodynamic bearing calculations
[IWECO-5076503] N86-15676
Variation objective analyses for cyclone studies N86-15777
Wave and surf forecast model evaluation for use on a micro computer
[AD-A159063] N86-15848
Mathematical theory of holographic memory N86-15946
Control and identification of time varying systems
[AD-A159067] N86-15999
Rapidly convergent algorithms for nonsmooth optimization
[AD-A159168] N86-16005
Multiple decision procedures for Tukey's generalized lambda distributions
[AD-A159153] N86-16021
Optimum frequency for propagation of sound in shallow sound channels
[AD-A159064] N86-16047
Numerical analysis for current neutralization of rotating light ion beam N86-16108
Target imposion in LIB ICF N86-16110
Nonlinear analysis of a relativistic beam-plasma cyclotron instability
[AD-A159159] N86-16115

Solution of the field equations for 2-D electromagnetic direct implicit plasma simulation
[DE85-016073] N86-16123
A computer simulation of the turbocharged turbo compounded diesel engine system: A description of the thermodynamic and heat transfer models
[NASA-CR-174971] N86-16164
Precessions of the Earth and the Bohr atom
[DE85-015612] N86-16171
Theoretical models for Type 1 and Type 2 supernova
[DE85-016288] N86-16174

MATHEMATICAL PROGRAMMING
LaPlace transformation with REDUCE 2
[INPE-3649-PRE/816] N86-15985

MATHEMATICS
China report: Science and technology
[JPRS-CST-85-038] N86-15438

MATHIEU FUNCTION
Analysis of elliptical waveguides in cylindrical reference basis N86-15612

MATRICES (MATHEMATICS)
Further informational properties of the Nash and Stackelberg solutions of LQG games
[AD-A158569] N86-15993
Variance component estimation method for sparse matrix applications
[PB85-234383] N86-16011
On the matrix convexity of the Moore-Penrose inverse and some applications
[AD-A158992] N86-16019
Inadmissibility of the best equivariant estimators of the variance-covariance matrix and the generalized variance under entropy loss
[AD-A159059] N86-16020

MATRIX THEORY
Modal analysis of unstable resonators
[AD-A159225] N86-15663

MAXIMUM LIKELIHOOD ESTIMATES
Selection of signals for digital optical channel N86-15471
A computer program for analyzing loglinear models with latent variables: LCAG N86-16026

MAXWELL EQUATION
Mathematical theory of holographic memory N86-15946
Analysis of microscopic instability for rotating LIB N86-16106

MEAN
Mean residual life: Theory and applications
[AD-A158589] N86-16013

MEANDERS
Dynamics and structure of Gulf Stream meanders northeast of Cape Hatteras, N.C. N86-15841

MEASURING INSTRUMENTS
Satellite passive microwave rain measurement techniques for land and ocean N86-15799
Remote sensing of severe convective storms N86-15800

MECHANICAL DEVICES
Progress on combined load- and profile-control for horizontal-turret, single- and double-arm tunnelling machines
[RR-276] N86-15674

MECHANICAL DRIVES
Principles and problems of building dc electric drives with symistor control N86-15598
Modular distributor for controlling group of electric drives N86-15599
Electric drive motors for industrial robots N86-15600

MECHANICAL ENGINEERING
Congressional Workshop on Advanced Materials Research and Development
[GPO-47-717] N86-15340
Progress on combined load- and profile-control for horizontal-turret, single- and double-arm tunnelling machines
[RR-276] N86-15674
Application and implementation of transient algorithms in computer programs
[DE85-015396] N86-15968

MECHANICAL PROPERTIES
Mechanical properties testing of candidate polymer matrix materials for use in high performance composites
[NASA-CR-177970] N86-15349
Mechanical properties and deformation behavior of martensite-ferrite dual-phase steels N86-15373
Design of foundations in permafrost
[AD-A158063] N86-15433
Nondestructive ultrasonic characterization of engineering materials
[NASA-CR-176349] N86-15680

MEDITERRANEAN SEA
Single station assessment of atmospheric boundary layer properties in the eastern Mediterranean Sea
[AD-A159432] N86-15827

MELTING POINTS
Test for a possible melting transition in grain boundaries in aluminum near the melting point
[DE85-013238] N86-15387

MEMBRANES
Investigation of mineral nutrition of a new form of microalgae to be used in biological life-support systems N86-15892

MEMORY
Potency of photoflash-produced retrograde amnesia in rats
[AD-A159149] N86-15859
A computer model of case-based reasoning in problem solving: An investigation in the domain of dispute mediation
[AD-A158097] N86-15912

MEMORY (COMPUTERS)
Variable radix processor
[AD-D011893] N86-15918
Raising the reliability of a remote processing system N86-15928
Distributed FIFO allocation of identical resources using small shared space
[AD-A159151] N86-15978
Comparison of 2D memory SEU transport simulations with experiments
[DE85-016134] N86-16137

MENTAL PERFORMANCE
On looking into the black box: Prospects and limits in the search for mental models
[AD-A159080] N86-15913

MERCURY CADMIUM TELLURIDES
Theoretical model of Hg(1-x)Cd(x)Te photovoltaic and photoconductive infrared detectors
[AD-A158668] N86-15551
Superlattice optical bistability research
[AD-A158876] N86-16128

MESOSCALE PHENOMENA
NASA/MSFC FY-85 Atmospheric Processes Research Review
[NASA-CP-2402] N86-15769
The use of satellite data in understanding and predicting convective and large-scale dynamical processes N86-15776
Airborne Doppler measurements of the central California extended sea breeze N86-15791
Response of the mesoscale atmosphere to diabatic heating N86-15794
Mesoscale ageostrophic circulations associated with baroclinic jet streaks N86-15795
Analysis of satellite data for sensor improvement (detection of severe storms from space) N86-15796
Automated mesoscale winds derived from GOES multispectral imagery N86-15798
Remote sensing of severe convective storms N86-15800
LAMPS software and mesoscale prediction studies N86-15801
Mesoscale: Cloud scale simulation of convective response N86-15802
Mesoscale research activities with the LAMPS model N86-15803
Cooperative VAS program with NASA Marshall Space Flight Center N86-15804
The assimilation of satellite soundings, winds and satellite products in a mesoscale analysis fr recast system N86-15805
Numerical simulation of convective response to mesoscale forcing N86-15806
A summary of research on mesoscale energetics of severe storm environments N86-15807
Investigations of severe/tornadic thunderstorm development and evolution based on satellite and AVE/SESAME/VAS data N86-15809
Improved satellite retrievals and mesoscale moisture variability N86-15812
Preliminary planning for the Satellite Precipitaion And Cloud Experiment (SPACE) field program N86-15814
Interactive information processing for NASA's mesoscale analysis and space sensor program N86-15817
Severe storm identification with satellite microwave radiometry: An initial investigation with Nimbus-7 SMMR data
[NASA-CR-176431] N86-15821
Satellite microwave observations of a storm complex: A comparative analysis
[NASA-CR-176430] N86-15822

METABOLISM
Investigation of some aspects of human amino acid metabolism during 120-day antiorthostatic hypokinesia N86-15873
Investigation of catecholamine metabolism at high altitudes N86-15880
Determination of increment of Bacillus subtilis biomass in weightlessness N86-15881
Investigation of distinctions referable to growth, development and metabolism of Closteriopsis acicularis algae when cells are limited in nitrogen as related to biological life-support systems for man N86-15883
Investigation of possibility of using two-frequency impedometry for estimation of proportion of total and extracellular body fluids N86-15888

METAL COMBUSTION
Preliminary results of velocities and deceleration of aluminum, magnesium, zirconium, tantalum, pyrofuze and titanium particles burning in steam
[AD-A159141] N86-15365
Burning time and size of aluminum, magnesium, zirconium, tantalum, and pyrofuze particles burning in steam
[AD-A159161] N86-15366

METAL CRYSTALS
Microelectronics technology N86-15930

METAL FIBERS
Thermal-mechanical fatigue test apparatus for metal matrix composites and joint attachments
[NASA-TM-87187] N86-15378

METAL MATRIX COMPOSITES
Energy function and conductivity of metal-polymer composites N86-15347
Metallographic preparation of particulate filled aluminum metal matrix composite material
[AD-D011862] N86-15352
Thermal-mechanical fatigue test apparatus for metal matrix composites and joint attachments
[NASA-TM-87187] N86-15378

METAL OXIDE SEMICONDUCTORS
Surface passivation of semiconductor circuit elements with layer of wideband semiconductor N86-15485
Characteristics of electrophysical and photoelectric properties of MOS-structures on indium arsenide N86-15486
Reducing dynamic errors of integrated-circuit CMOS switches N86-15492
Electrical characteristics of Si devices fabricated with completely consumed carbide (C3) dielectric isolation process
[AD-A158296] N86-15547
Completely consumed carbide (C3) - A new process for dielectric isolation
[AD-A158298] N86-15548
VLSI (Very Large Scale Integrated) design of a sixteen bit pipelined multiplier using three micron NMOS technology
[AD-A159433] N86-15557
Variable radix processor
[AD-D011893] N86-15918
Fundamental studies and device development in beta silicon carbide
[AD-A159446] N86-16132

METAL OXIDES
Fluidized reduction of oxides on fine metal powders without sintering
[NASA-TM-77928] N86-15379

METAL PARTICLES
Fluidized reduction of oxides on fine metal powders without sintering
[NASA-TM-77928] N86-15379

METAL PLATES
The Dowling wall pressure-spectrum analogy applied to an isotropic two-layered elastic medium
[AD-A158009] N86-15632

METAL POWDER
Mach stem characterization in Mbar designs using RSR powder
[DE85-015700] N86-15385

METALLIC GLASSES
East Europe report: Science and technology
[JPRS-ESA-85-031] N86-15893

METALLOGRAPHY
Metallographic preparation of particulate filled aluminum metal matrix composite material
[AD-D011862] N86-15352

METALS
Production of glass or glass-ceramic to metal seals with the application of pressure
[DE85-017746] N86-15403
China report: Science and technology
[JPRS-CST-85-040] N86-15478
Overlap of electron core states for very high compressions
[DE85-015745] N86-16138

METEORITES
Antarctic Meteorite Newsletter, Volume 8, Number 2
[NASA-CR-176401] N86-16167

METEOROIDS
Cosmogenic neutron-capture-produced nuclides in stony meteorites
[DE85-012639] N86-16170

METEOROLOGICAL PARAMETERS
Variation objective analyses for cyclone studies N86-15777
Severe storm electricity N86-15783
Analysis of satellite data for sensor improvement (detection of severe storms from space) N86-15796
A design study for a three-dimensional display computer terminal for meteorological information N86-15816
Multispectral atmospheric mapping sensor of mesoscale water vapor features N86-15819
Use of space shuttle photography in the study of meteorological phenomena
[AD-A159415] N86-15826
Climatological data of stations in the Netherlands. No. 24: A climatology of Amsterdam airport for the period 1951 - 1980
[KNMI-150-24] N86-15837
Laplacian smoothing splines with generalized cross validation for objective analysis of meteorological data
[AD-A159336] N86-16006

METEOROLOGICAL SATELLITES
Response of the mesoscale atmosphere to diabatic heating N86-15794
Analysis of satellite data for sensor improvement (detection of severe storms from space) N86-15796
Severe storm detection with passive 37 Ghz observations N86-15797
Satellite passive microwave rain measurement techniques for land and ocean N86-15799
Remote sensing of severe convective storms N86-15800
Severe storm identification with satellite microwave radiometry: An initial investigation with Nimbus-7 SMMR data
[NASA-CR-176431] N86-15821

METEOROLOGICAL SERVICES
Activities report in meteorology
[AR-83/84] N86-15836

METEOROLOGY
The use of satellite data in understanding and predicting convective and large-scale dynamical processes N86-15776
Observational and theoretical studies of the evolving structure of baroclinic waves: Attractor dynamics of global weather systems N86-15781
Tahiti Island Pacific limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159607] N86-15832
Pirmasens AHP DL, West Germany limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159608] N86-15833
Revised Uniform Summary of Surface Weather Observations (RUSSWO). Parts A-F Fort Belvoir/Davison AAF, Virginia
[AD-A159609] N86-15834
Yongsan Reservation, Korea limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159610] N86-15835
Activities report in meteorology
[AR-83/84] N86-15836

METHANE
Moldable electrically conductive polymer compositions
[AD-D011887] N86-15402

METHYL ALCOHOLS
Bulletin of the Faculty of Engineering, Hokkaido University, no. 128
[ISSN-0385-602X] N86-15420
The catalytic activity and selectivity of chemical treated clinoptilolite in the conversion of methanol N86-15424

MICROBIOLOGY
Determination of increment of Bacillus subtilis biomass in weightlessness N86-15881
Investigation of microflora of chufa, a potential higher plant component of biological life-support systems for man N86-15882

MICROCHANNELS
Novel control circuit for proximity focused microchannel plate image intensifiers N86-15481

MICROCOMPUTERS
Digital servocontroller system. Volume 2. Maintenance manual
[AD-A159066] N86-15322
China report: Science and technology
[JPRS-CST-85-038] N86-15438
MC68000 monitor program disassembled N86-15479
Wave and surf forecast model evaluation for use on a micro computer
[AD-A159063] N86-15848
Program base for raster display N86-15937
Microcomputer networking in libraries. Report of a study visit to the United States 14th October 1983
[BLRDR-5819] N86-15976

MICROCRACKS
Investigations of the relations between the damage evolution of vibrationally loaded samples and the measuring quantities of the instrumented accelerated fatigue test during the crackfree fatigue phase and microcrack formation phase N86-15894

MICROCRYSTALS
Novel sorbents for high temperature regenerative H2S removal
[NASA-CR-176449] N86-15360

MICROELECTRONICS
West Europe report: Science and technology
[JPRS-WST-85-028] N86-15435
West Europe report: Science and technology
[JPRS-WST-85-015] N86-15443
West Europe report: Science and technology
[JPRS-WST-85-024] N86-15447
Noise characteristics of stroboscopic transducers built with GaAs microcircuit integration N86-15489
A two-terminal microelectrochemical diode with contact spacing of about one micron. A device based on one solution redox couple and one electrode-confined redox couple
[AD-A158774] N86-15553
USSR report: Cybernetics, computers and automation technology
[JPRS-UCC-85-004] N86-15927
Raising the reliability of a remote processing system N86-15928
Microelectronics technology N86-15930

MICROMECHANICS
A study of reactive sputter etching for carbon steel by Freon gas: On the effect of oxygen gas mixture N86-15422

MICROORGANISMS
Investigation of microflora of chufa, a potential higher plant component of biological life-support systems for man N86-15882
Formation of volatile substances during polymer destruction by Pseudomonas aeruginosa N86-15884
Gas chromatographic analysis of free fatty acids of skin surface lipids N86-15891

MICROPHONES
Location of noise sources using a phase-slope method
[NASA-TP-2505] N86-16041

MICROPROCESSORS
Robotron hardware compatible programming languages surveyed N86-15474
Microprocessor application in error code correction N86-15480
USSR report: Cybernetics, computers and automation technology
[JPRS-UCC-85-004] N86-15927
Raising the reliability of a remote processing system N86-15928
Procedures and general method for checking microprocessor malfunctions on the basis of pseudorandom testing sequences N86-15929
Program base for raster display N86-15937
High-speed receivers of microprocessor signal conversion devices N86-15938
Assurance Program for Remedial Action (APRA) microcomputer-operated bibliography management system
[DE85-008763] N86-16155

MICROSTRIP TRANSMISSION LINES
Experimental study of unidirectional ferrite microstrip lines N86-15500
Investigations and comparisons of new types of millimetre-wave planar arrays using microstrip and dielectric structures
[AD-A158313] N86-15522

MICROSTRUCTURE
Melting and consolidation of nickel alloy powders with a plasma jet operating in a low pressure inert environment N86-15374
The role of microstructure in hydrogen-assisted crack initiation in high strength steels N86-15375
Fundamental studies on the Aluminum-Lithium-Beryllium alloy system
[AD-A158088] N86-15381
Microstructural evaluation of 49Co-49Fe-2V alloy
[DE85-016500] N86-15388
Microstructural control to improve the properties of chromium-molybdenum weld metal
[DE85-016179] N86-15390
Microstructures built from electroactive polymers: Toward a macromolecular electronics
[AD-A159430] N86-15400
Microstructural origins of hot spots in RDX explosive and several reference inert materials
[AD-A158223] N86-15413
Radiation effects in actinide host phases
[DE85-016273] N86-16075

MICROWAVE AMPLIFIERS
Textured carbon on copper: A novel surface with extremely low secondary electron emission characteristics
[NASA-TP-2543] N86-15394
Acceptance test plan for broadband microwave amplifier panel
[AD-A159450] N86-15558
Power combinations microwave amplifier loading characteristics N86-15610

MICROWAVE EMISSION
Micro-power dissipation device described N86-15441
Plasma parameters at low level of intrinsic microwave radiation N86-15466

MICROWAVE FILTERS
Multilayer volume microwave filters N86-15465
Active microwave filters N86-15467

MICROWAVE LANDING SYSTEMS
A fault tolerant system for an integrated avionics sensor configuration
[NASA-CR-3834] N86-15278

MICROWAVE PLASMA PROBES
Plasma parameters at low level of intrinsic microwave radiation N86-15466

MICROWAVE RADIOMETERS
Microwave radiometers for remote sensing applications
[REPT-S-157] N86-15716
Severe storm detection with passive 37 Ghz observations N86-15797
First Meeting of the Working Group on the Shuttle Microwave Precipitation Radiometer (SMPR) N86-15820
Severe storm identification with satellite microwave radiometry: An initial investigation with Nimbus-7 SMMR data
[NASA-CR-176431] N86-15821

MICROWAVE SCATTERING
Severe storm detection with passive 37 Ghz observations N86-15797

MICROWAVE SENSORS
Analysis of satellite data for sensor improvement (detection of severe storms from space) N86-15796

MICROWAVE TRANSMISSION
Satellite passive microwave rain measurement techniques for land and ocean N86-15799

MICROWAVES
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-011] N86-15484
Activities report of the Radio Laboratory
[REPT-S-160] N86-15534
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-006] N86-15561
Reflection coefficient of harrow grating with conductor strips with respect to electromagnetic waves N86-15577
Strip and microstrip line periodic heterogeneities N86-15608
Observation of microwave Cerenkov radiation as diffraction pattern
[AD-A159337] N86-16057
Research on the crystal growth and dielectric properties of high permittivity ferroelectric materials
[AD-A157820] N86-16126

MIGRATION
Migration of hazardous substances through soil. Part 2: Determination of the leachability of metals from five industrial wastes and their movement within soil
[AD-A158990] N86-15740

MILITARY OPERATIONS
Light helicopter family trade-off analysis. Volume 8: Appendices S and T
[AD-A158077] N86-15308
The airlift dilemma: An update
[AD-A159307] N86-15353

MILITARY SPACECRAFT
Space activities of the United States, Soviet Union and other launching countries/organizations, 1957-1984
[GPO-46-504] N86-15330

MILITARY TECHNOLOGY
Integrated Services Digital Network (ISDN)
[AD-A159578] N86-15531
A research program in computer technology
[AD-A157991] N86-15920

MILLIMETER WAVES
Millimetric-wave antennas and devices: Review N86-15453
Analysis of multimode waveguide-type power distributor N86-15458
Research on the crystal growth and dielectric properties of high permittivity ferroelectric materials
[AD-A157820] N86-16126

MINERAL DEPOSITS
East Europe report: Science and technology
[JPRS-ESA-85-037] N86-15408

MINIMAX TECHNIQUE
Accuracy of polynomial approximation of quasi-minimax methods N86-15427
MINING
East Europe report: Science and technology [JPRS-ESA-85-037] N86-15408
MIRRORS
Crystal analyser mirror type down-scattering spectrometer using spallation neutron source N86-15425
MIS (SEMICONDUCTORS)
Metal-insulator transition and Landau Fermi liquid theory [NOTA-INTERNA-844] N86-16142
MISSILES
Acoustical imaging system evaluation [AD-A159425] N86-15684
MISSION PLANNING
Aircraft flight performance methods. Revision 2 [AD-A158227] N86-15310
MIXING
Effect of optical injection on the optical properties of a (GaAl)As semiconductor laser: Optical bistability and four wave mixing [ENST-85E005] N86-15667
MIXING CIRCUITS
Noise characteristics of stroboscopic transducers built with GaAs microcircuit integration N86-15489
MOBILE COMMUNICATION SYSTEMS
Broadband simulation of multipath propagation in VHF mobile radio [MBB-UA-905/85] N86-15540
MODAL RESPONSE
Analytical study of acoustic response of a semireverberant enclosure with application to active noise control [NASA-TP-2472] N86-16040
MODELS
Prediction of wing aeroelastic effects on aircraft lift and pitching moment characteristics [NASA-TM-87631] N86-15319
Time dependent rate theory for diffusional defect processes [ORNL-6122] N86-15355
Summaries of Center for Fire Research grants and in-house programs, 1985 [NBSIR-85-3258] N86-15429
Structural transformations in semiconductors during optical pumping N86-15490
Host groups: A multicast extension for datagram internetworks [AD-A159146] N86-15526
Deep convection in mesoscale convective systems N86-15782
Wave and surf forecast model evaluation for use on a micro computer [AD-A159063] N86-15848
Modeling problem-oriented multiprocessor systems N86-15932
Ultrasonic measurement of particles in a viscous fluid [AD-A158989] N86-16046
Research on intense electron beams and applications [AD-A158234] N86-16055
MBE-4, a heavy ion multiple-beam experiment [DE85-016626] N86-16064
Magnetohydrodynamic stability of sphereomak plasma in toroidal flux conserver with rectangular cross section. Part 2: Application of Mercier criterion [IPPJ-743] N86-16114
MODULATION
A new approach to signal registration with the emphasis on variable time delay estimation N86-15514
Experiments in long-wavelength communication using modulated electron beam antennas: A parameter study [AD-A157810] N86-15519
A brief investigation of adaptive decision feedback equalization for digital HF links employing PSK (Phase Shift Keying) modulation [AD-A157809] N86-15545
Ferromagnetic resonance probe liftoff suppression apparatus [AD-D011913] N86-15647
MODULATION TRANSFER FUNCTION
Pulse-type voltage stabilizer with integral pulse-width modulation N86-15505
Influence of roughness of ends of fiber optic plates on modulation transfer coefficient N86-15508
LANDSAT-4 Thematic Mapper Modulation Transfer Function (MTF) evaluation [E86-10017] N86-15710
MODULUS OF ELASTICITY
Spring stiffnesses for beam-column analysis of soil-structure interaction problems [AD-A158072] N86-15690
MOISTURE
Mechanical properties testing of candidate polymer matrix materials for use in high performance composites [NASA-CR-177970] N86-15349
Improved satellite retrievals and mesoscale moisture variability N86-15812
MOISTURE CONTENT
Condensation potential in high thermal performance walls. Hot, humid summer climate [AD-A158002] N86-15431
Formulas concerning nonelectrical properties of snow: The electrical engineer's point of view [REPT-S-156] N86-15715
Mixing formulas and experimental results of the dielectric constant of snow [REPT-S-158] N86-15717
The assimilation of satellite soundings, winds and satellite products in a mesoscale analysis forecast system N86-15805
Results of icing flights in winter 1983/84: Ice accretion thickness in correlation with cloud physical parameters, object and cloud parameters [DFVLR-FB-85-39] N86-15838
On the effects of X irradiation on the Bacillus subtilis spores in a day and wet system [DFVLR-FB-85-44] N86-15864
Effect of dry immersion model on parameters of fluid-electrolyte metabolism, blood plasma aldosterone and cortisol levels in individuals differing in body fluid content N86-15875
MOLDING MATERIALS
Moldable electrically conductive polymer compositions [AD-D011887] N86-15402
MOLECULAR BEAM EPITAXY
Integrated optoelectronic circuits utilizing InGaAsP grown by molecular beam epitaxy [AD-A159403] N86-16129
MOLECULAR BIOLOGY
Biotechnology and agriculture [GPO-48-672] N86-15712
MOLECULAR COLLISIONS
In search of high J states in the HF(v, J) system [AD-A158937] N86-16073
MOLECULAR ENERGY LEVELS
The parameters of adiabatic rapid passage in the 0-0 hyperfine transition of Rb-87 [AD-A158562] N86-16056
MOLECULAR FLOW
In search of high J states in the HF(v, J) system [AD-A158937] N86-16073
MOLECULAR GASES
Laser plus surface-dynamics facility [AD-A158922] N86-15661
MOLECULAR IONS
Molecular processes in a high temperature shock layer [NASA-CR-176357] N86-16054
MOLECULAR OSCILLATIONS
In search of high J states in the HF(v, J) system [AD-A158937] N86-16073
MOLECULAR RELAXATION
Configurational diffusion in semidilute solutions [DE85-017121] N86-15405
The parameters of adiabatic rapid passage in the 0-0 hyperfine transition of Rb-87 [AD-A158562] N86-16056
MOLECULAR ROTATION
In search of high J states in the HF(v, J) system [AD-A158937] N86-16073
MOLECULAR SPECTRA
Micro-Raman spectroscopy: The analysis of micrometer and submicrometer atmospheric aerosols [NASA-CR-177964] N86-15756
MOLECULES
Microstructures built from electroactive polymers: Toward a macromolecular electronics [AD-A159430] N86-15400
MOLYBDENUM
Microstructural control to improve the properties of chromium-molybdenum weld metal [DE85-016179] N86-15390
MOLYBDENUM COMPOUNDS
Hydrogen diffusion, positron annihilation in 40CrNiMo steel N86-15439
MOMENTS
Seismic moment tensor recovery at low frequencies N86-15750
MONITORS
Optical emission line monitor with background observation and cancellation [DE85-017745] N86-15370
MC68000 monitor program disassembled N86-15479
Raising the reliability of a remote processing system N86-15928
MONOCHROMATORS
Integrating sphere spectrometer for high-temperature materials characterization [DE85-012170] N86-15656
MONOTONE FUNCTIONS
Dynamic monotone priorities on planar sets (extended abstract) [AD-A158610] N86-15955
MONTE CARLO METHOD
Tests for a change-point [AD-A159381] N86-16025
MOTION PERCEPTION
Enhancing visual sensitivity [AD-A158799] N86-15906
MOTION SICKNESS
Statistical research on problems of biodynamics [AD-A157993] N86-15899
MOTION SIMULATION
Transverse motion of high speed barium clouds in the ionosphere [AD-A159058] N86-15760
MOTION STABILITY
Balancing of a rod using a digitally controlled robot [DFVLR-FB-85-41] N86-15677
MOTORS
Machine with an intermittently rotating table for the performance of work operations [AD-D011911] N86-15669
Acoustical imaging system evaluation [AD-A159425] N86-15684
MULTIBEAM ANTENNAS
The design of a Rotman lens [FEL-1985-13] N86-15537
MULTICHANNEL COMMUNICATION
Severe storm detection with passive 37 Ghz observations N86-15797
MULTIENGINE VEHICLES
Aircraft accident report: Vieques Air Link, Inc., Britten-Norman BN-21-6 Islander, N589SA, Vieques, Puerto Rico, August 2, 1984 [PB85-901408] N86-15276
MULTIMODE RESONATORS
Self-modulation instability of gyrotron emission N86-15501
MULTIPATH TRANSMISSION
Broadband simulation of multipath propagation in VHF mobile radio [MBB-UA-905/85] N86-15540
Specific recommendations for improving network feedback to hosts [AD-A158768] N86-15924
MULTIPLE ACCESS
Main trends in satellite communication and broadcasting research N86-15494
MULTIPLEXING
Self-guarding Schottky barrier infrared detector array [AD-D011894] N86-15541
MULTIPOLES
Residues of integrals with three-dimensional multipole singularities, with application to the Lagally theorem [AD-A158771] N86-15995
MULTIPROCESSING (COMPUTERS)
USSR report: Cybernetics, computers and automation technology [JPRS-UCC-85-004] N86-15927
Organization of processor oriented to multiprocessing N86-15931
Modeling problem-oriented multiprocessor systems N86-15932
Multiprocessor systems with dynamic redistribution of requests through a common bus N86-15933
Cybernetics Institute develops parallel-processing computer N86-15936
An interactive discrete controls analysis option (ORACLS) for the CONTROLS analysis package on the IBM 3033 [AD-A158754] N86-15956
Implementation of a serial delay insertion type loop communication for a real time multitransputer system [AD-A158980] N86-15960
MULTISPECTRAL BAND SCANNERS
A comparison of LANDSAT TM to MSS imagery for detecting submerged aquatic vegetation in lower Chesapeake Bay N86-15707
Remote reconnaissance of submerged aquatic vegetation: A radiative transfer approach N86-15708
Automated mesoscale winds derived from GOES multispectral imagery N86-15798
MULTISTATIC RADAR
Solution to reverse refraction problem N86-15562
MULTIVARIATE STATISTICAL ANALYSIS
Degenerate multivariate stationary processes: Basicity, past and future, and autoregressive representation [AD-A158879] N86-16015

On determining the predictor of Non-Full-Rank multivariate stationary random processes
[AD-A159165] N86-16024

MUSCULAR FUNCTION
Effect of 7-day immersion hypokinesia on characteristics of precision movements N86-15874

MUSCULAR STRENGTH
Application of the system identification technique to goal-directed saccades
[AD-A159102] N86-15909
A comparison of the effects of circuit weight training on men and women
[AD-A159419] N86-15910

MUTAGENS
Electron reactions in model and biological systems
[DE85-016062] N86-15861

MUTATIONS
Electron reactions in model and biological systems
[DE85-016062] N86-15861

N

N-TYPE SEMICONDUCTORS
Photoluminescent response of palladium-cadmium sulfide and palladium-graded cadmium sulfoselenide Schottky diodes to molecular hydrogen
[AD-A158759] N86-15552

NASA PROGRAMS
Space activities of the United States, Soviet Union and other launching countries/organizations, 1957-1984
[GPO-46-504] N86-15330
NASA patent abstracts bibliography: A continuing bibliography. Section 1: Abstracts (supplement 26)
[NASA-SP-7039(26)-SECT-1] N86-16151

NATURAL LANGUAGE (COMPUTERS)
The design and analysis of a stylized natural grammar for an object-oriented language (OMEGA)
[AD-A159434] N86-15964

NAVIER-STOKES EQUATION
Relative advantages of thin-layer Navier-Stokes and interactive boundary-layer procedures
[NASA-TM-86778] N86-15244
Effects of waves on the boundary layer of a surface-piercing body
[AD-A158053] N86-15633

NAVIGATION AIDS
A fault tolerant system for an integrated avionics sensor configuration
[NASA-CR-3834] N86-15278

NAVY
Implementation of multifunction information systems at three Navy facilities
[AD-A157797] N86-16153

NEAR WAKES
Vortices and pressure waves at trailing edges
[ISL-CO-224/84] N86-15252
Recent developments in three-dimensional wake analysis N86-15273

NEODYMIUM LASERS
Solar-pumped solid state Nd lasers
[NASA-TM-87615] N86-15658

NETHERLANDS
Image registration N86-15718
Climatological data of stations in the Netherlands. No. 24: A climatology of Amsterdam airport for the period 1951 - 1980
[KNMI-150-24] N86-15837
The effect of the wind in the Eemsmond (the Netherlands, West Germany) on high tide levels in Delfzijl (the Netherlands)
[KNMI-TR-63] N86-15858

NETWORK ANALYSIS
Specific recommendations for improving network feedback to hosts
[AD-A158768] N86-15924
The equal flow problem
[AD-A159594] N86-16028
Probabilistic analysis of a network resource allocation algorithm. Revision
[AD-A158970] N86-16150

NETWORK SYNTHESIS
Host groups: A multicast extension for datagram internetworks
[AD-A159146] N86-15526

NEUROMUSCULAR TRANSMISSION
Application of the system identification technique to goal-directed saccades
[AD-A159102] N86-15909

NEURONS
Stochastic differential equations for neuronal behavior
[AD-A159099] N86-15908
Application of the system identification technique to goal-directed saccades
[AD-A159102] N86-15909

NEUTRAL BEAMS
Analysis of microscopic instability for rotating LIB N86-16106

NEUTRAL PARTICLES
Significance of single particle effects in neutral beam weapon lethality
[DE85-012031] N86-16068

NEUTRALIZERS
Mechanisms of excitation and ionization processes in sputtering
[AD-A158061] N86-15361

NEUTRINOS
Does one need a fourth generation of leptons
[PREPRINT-461] N86-16071
Nucleon structure functions from neutrino scattering
[NOTA-INTERNA-851] N86-16072

NEUTRON BEAMS
Improving neutron reaction data through linac-based flight-time spectrometry
[DE85-016417] N86-16062
Dependence of charge collection distributions and dose on the gas type filling the ionization chamber for a p(66)Be(49) clinical neutron beam
[DE85-017366] N86-16117

NEUTRON CROSS SECTIONS
Improving neutron reaction data through linac-based flight-time spectrometry
[DE85-016417] N86-16062
Possibilities at LAMPF for studying nuclei of astrophysical interest
[DE85-017526] N86-16173

NEUTRON SCATTERING
Cosmogenic neutron-capture-produced nuclides in stony meteorites
[DE85-012689] N86-16170

NEUTRON SOURCES
Bulletin of the Faculty of Engineering, Hokkaido University, no. 128
[ISSN-0385-602X] N86-15420
Crystal analyser mirror type down-scattering spectrometer using spallation neutron source N86-15425
Improving neutron reaction data through linac-based flight-time spectrometry
[DE85-016417] N86-16062

NEUTRON SPECTRA
Mean fission neutron spectrum energies for (252) Cf and fissile nuclides, (233)U, (235)U, (239)Pu and (241)Pu
[DE85-013298] N86-16086

NEUTRON STARS
Emission region of gamma ray bursts
[DE85-013198] N86-16183

NEUTRONS
Workshop on Radiobiological Effectiveness of Neutrons
[DE85-017577] N86-16084

NICKEL ALLOYS
The application of diffusion theory to the analysis of hydrogen desorption data at 25 deg C
[NASA-TM-86531] N86-15359
Melting and consolidation of nickel alloy powders with a plasma jet operating in a low pressure inert environment N86-15374
Crystallographic fatigue crack propagation in single crystal nickel-base superalloy N86-15377
Mach stem characterization in Mbar designs using RSR powder
[DE85-015700] N86-15385

NICKEL COMPOUNDS
Hydrogen diffusion, positron annihilation in 40CrNiMo steel N86-15439

NIMBUS 7 SATELLITE
Severe storm identification with satellite microwave radiometry: An initial investigation with Nimbus-7 SMMR data
[NASA-CR-176431] N86-15821

NIOBATES
Heterogeneous response of aluminum and lithium niobate to shock waves
[DE85-013963] N86-16140

NIOBIUM COMPOUNDS
Thin superconducting film characterization by surface acoustic waves
[AD-A158311] N86-16127

NITRAMINE PROPELLANTS
Critical analysis of nitramine decomposition data: Product distributions from HMX and RDX decomposition
[AD-A159325] N86-15368

NITROGEN
Catalytic surface effects on contaminated space shuttle tile in a dissociated nitrogen stream
[NASA-TM-86770] N86-15335
Man's tolerance to fulminant form of hypoxic hypoxia N86-15879
Investigation of distinctions referable to growth, development and metabolism of Closteriopsis acicularis algae when cells are limited in nitrogen as related to biological life-support systems for man N86-15883

NITROGEN DIOXIDE
Spectroscopic studies of detonating heterogeneous explosives
[DE85-007687] N86-15419

NOISE (SOUND)
Hydrodynamic noise and surface compliance--an overview of the Naval Underwater Systems Center IR/IED program
[AD-A157799] N86-15630

NOISE GENERATORS
Location of noise sources using a phase-slope method
[NASA-TP-2505] N86-16041

NOISE PROPAGATION
Analytical study of acoustic response of a semireverberant enclosure with application to active noise control
[NASA-TP-2472] N86-16040

NOISE REDUCTION
Analytical study of acoustic response of a semireverberant enclosure with application to active noise control
[NASA-TP-2472] N86-16040
On second propagation in radial fan casings
[DFVLR-FB-85-32] N86-16053

NOISE SPECTRA
The detection of faint space object with solid state image detectors
[AD-A158594] N86-16166

NOISE THRESHOLD
Visibility of noise in homogeneous and textured areas
[FOA-C-50010-H2] N86-15536

NONDESTRUCTIVE TESTS
Concepts for the development of a nondestructive testing and evaluation system for rigid airfield pavements
[AD-A158004] N86-15324
Ferromagnetic resonance probe liftoff suppression apparatus
[AD-D011913] N86-15647
Theoretical studies in nondestructive evaluation (NDE)
[AD-A159155] N86-15682
Use of ultrasonics to determine the crack size in high strength steel gun barrels
[AD-A159405] N86-15683
Acoustical imaging system evaluation
[AD-A159425] N86-15684

NONEQUILIBRIUM FLOW
Separated transonic airfoil flow calculations with a nonequilibrium turbulence model
[NASA-TM-86830] N86-15247

NONEQUILIBRIUM THERMODYNAMICS
Computer simulation of nonequilibrium processes
[DE85-015708] N86-16036

NONLINEAR EQUATIONS
Nonlinear diffusion equations
[AD-A158305] N86-15992
Numerical methods for singularly perturbed differential equations with applications
[AD-A158969] N86-15997
Some solvable dynamical systems
[PREPRINT-441] N86-16008
Triple pendulum for the demonstration of nonlinear coupling
[LAB-REPT-763] N86-16032
Triple pendulum for the demonstration of nonlinear coupling N86-16033
A multiple pendulum for the demonstration of nonlinear coupling N86-16034

NONLINEAR EVOLUTION EQUATIONS
Nonlinear evolution equations associated with a Riemann-Hilbert scattering problem
[PREPRINT-458] N86-16030

NONLINEAR OPTICS
Subnanosecond short wavelength generation using optical fibers
[AD-A158769] N86-16090
Self-consistent approximation for squeezing generation in a nonlinear optical medium
[NOTA-INTERNA-845] N86-16094

NONLINEAR SYSTEMS
Nonlinear dynamics of a helicopter model in ground resonance N86-15284
A new approach to signal registration with the emphasis on variable time delay estimation N86-15514
A conservation law related to Kelvin's circulation theorem
[AD-A157819] N86-15631
On the optimal control of nonlinear systems
[RR-278] N86-15981
Nonlinear control of distributed parameter systems
[INPE-3623-PRE/807] N86-15986

Control of nonlinear distributed parameter systems [INPE-3624-PRE/808] N86-15987
Rapidly convergent algorithms for nonsmooth optimization [AD-A159168] N86-16005
Research in applied mathematics related to nonlinear system theory [AD-A158330] N86-16027
Introduction to nonlinear systems analysis and identification [RR-277] N86-16029
A theoretical investigation of acoustic cavitation [AD-A158058] N86-16042
Superlattice optical bistability research [AD-A158876] N86-16128

NONLINEARITY
Evolution of nonlinear wave groups on water of slowly-varying depth [AD-A158860] N86-15635
Nondestructive ultrasonic characterization of engineering materials [NASA-CR-176349] N86-15680
Intense e-beam interaction with matter [DE85-017093] N86-16063

NONUNIFORM FLOW
Studies on the interference of wings and propeller slipstreams N86-15241

NONUNIFORMITY
Non-uniform bounds of normal approximation for finite-population U-statistics [AD-A159163] N86-16003

NORMAL DENSITY FUNCTIONS
Mean residual life: Theory and applications [AD-A158589] N86-16013

NORTH AMERICA
Peat landforms along the Albany River, northern Ontario. An ecological study of peat landforms in Canada and Alaska [E86-10014] N86-15704

NOZZLE THRUST COEFFICIENTS
An analysis of cross-coupling of a multicomponent jet engine test stand using finite element modeling techniques [NASA-CR-176424] N86-15323

NUCLEAR BINDING ENERGY
Tables of masses, binding energies, half-lives and natural abundances [DE85-016344] N86-16061

NUCLEAR EXPLOSION EFFECT
Worldwide deposition of (90)Sr through 1983 [DE85-017599] N86-15741

NUCLEAR EXPLOSIONS
Calculating the vulnerability of synthetic polymers to autoignition during nuclear flash [AD-A159420] N86-15399
Radionuclide Migration Project 1984 [DE85-017383] N86-16076

NUCLEAR FUEL REPROCESSING
Demonstration of the in-field use of calorimetric assay for IAEA inspection purposes [DE85-016448] N86-16083

NUCLEAR FUELS
Demonstration of the in-field use of calorimetric assay for IAEA inspection purposes [DE85-016448] N86-16083

NUCLEAR FUSION
Low activation ferritic alloys [DE85-017795] N86-15384

NUCLEAR HEAT
Calculating the vulnerability of synthetic polymers to autoignition during nuclear flash [AD-A159420] N86-15399

NUCLEAR MODELS
Friction in nuclear dynamics [DE85-011984] N86-16066

NUCLEAR PHYSICS
China report: Science and technology [JPRS-CST-85-038] N86-15438

NUCLEAR POWER REACTORS
Low activation ferritic alloys [DE85-017795] N86-15384

NUCLEAR REACTIONS
Friction in nuclear dynamics [DE85-011984] N86-16066

NUCLEAR REACTORS
Advances in optoelectronic, nuclear reactor, radiobiological research: High voltage optocoupler N86-15896

NUCLEAR STRUCTURE
Nucleon structure functions from neutrino scattering [NOTA-INTERNA-851] N86-16072

NUCLEI (NUCLEAR PHYSICS)
Possibilities at LAMPF for studying nuclei of astrophysical interest [DE85-017526] N86-16173

NUCLEON-NUCLEON SCATTERING
Nucleon structure functions from neutrino scattering [NOTA-INTERNA-851] N86-16072

NUCLEONICS
Nucleon structure functions from neutrino scattering [NOTA-INTERNA-851] N86-16072

NUCLIDES
Cosmogenic neutron-capture-produced nuclides in stony meteorites [DE85-012689] N86-16170

NUMBER THEORY
A new enumeration scheme for the knapsack problem [INPE-3563-PRE/769] N86-15983

NUMERICAL ANALYSIS
Development and application of a time-history analysis for rotorcraft dynamics based on a component approach N86-15291
Variation objective analyses for cyclone studies N86-15777
Numerical methods for singularly perturbed differential equations with applications [AD-A158969] N86-15997

NUMERICAL CONTROL
Balancing of a rod using a digitally controlled robot [DFVLR-FB-85-41] N86-15677
USSR report: Cybernetics, computers and automation technology [JPRS-UCC-85-004] N86-15927

NUMERICAL FLOW VISUALIZATION
Computational fluid dynamics at NASA Ames and the numerical aerodynamic simulation program [NASA-TM-86769] N86-15626

NUMERICAL INTEGRATION
Stochastic integration for operator valued processes on Hilbert spaces and on nuclear spaces [AD-A158878] N86-16014

NUMERICAL WEATHER FORECASTING
LAMPS software and mesoscale prediction studies N86-15801
Mesoscale research activities with the LAMPS model N86-15803
Cooperative VAS program with NASA Marshall Space Flight Center N86-15804
The assimilation of satellite soundings, winds and satellite products in a mesoscale analysis forecast system N86-15805

O

OBSERVATION
Kitzingen Al, Germany limited surface observations climatic summary (LISOCS). Parts A, c-f [AD-A159604] N86-15829
AL Jubayl/Dhahran, Saudi Arabia limited surface observations climatic summary (LISOCS). Parts A, c-f [AD-A159605] N86-15830
Dakar senegal limited surface observations climatic summary (LISOCS). Parts A, c-f [AD-A159606] N86-15831
Tahiti Island Pacific limited surface observations climatic summary (LISOCS). Parts A, c-f [AD-A159607] N86-15832
Revised Uniform Summary of Surface Weather Observations (RUSSWO). Parts A-F Fort Belvoir/Davison AAF, Virginia [AD-A159609] N86-15834
Yongsan Reservation, Korea limited surface observations climatic summary (LISOCS). Parts A, c-f [AD-A159610] N86-15835

OCEAN BOTTOM
A review of biological processes within oceanic water columns relevant to the assessment of the safety of disposal of waste, notably radioactive isotopes, on or within the seabed [IOS-198] N86-15745
The effect of the Benthic Boundary Layer on the physics of intense mesoscale eddies N86-15751
Description, analysis, and prediction of sea-floor roughness using spectral models [AD-A158000] N86-15846
The CTD data from the Northeast Atlantic 22 N-33 N, 19 W-24 W, July 1983. Discovery cruises 138, 139. --- conductivity, temperature, depth (CTD) [IOS-188] N86-15850
CTD data from the Northeast Atlantic Ocean 40-48 N, 12-21 W collected on RRS DISCOVERY cruise 132 in February 1983 --- conductivity, temperature, depth (CTD) [IOS-192] N86-15851
The permeability and consolidation of deep sea sediments [IOS-201] N86-15855

OCEAN CURRENTS
Dynamics and structure of Gulf Stream meanders northeast of Cape Hatteras, N.C. N86-15841
Development of slope spectra of the wind-disturbed water surface N86-15842
Wave and surf forecast model evaluation for use on a micro computer [AD-A159063] N86-15848
A numerical model of the turbulent boundary layer beneath surface waves and tides [IOS-196] N86-15854
Automatic calibration of the temperature channel on Banderaa recording current meters --- ocean currents [IOS-206] N86-15856

OCEAN DATA ACQUISITIONS SYSTEMS
The permeability and consolidation of deep sea sediments [IOS-201] N86-15855
Automatic calibration of the temperature channel on Banderaa recording current meters --- ocean currents [IOS-206] N86-15856

OCEAN DYNAMICS
Observations of equatorially trapped waves in the eastern Atlantic Ocean from inverted echo sounders N86-15840
Dynamics and structure of Gulf Stream meanders northeast of Cape Hatteras, N.C. N86-15841
Development of slope spectra of the wind-disturbed water surface N86-15842

OCEAN MODELS
A numerical study on the response of the tropical Pacific sea surface temperature to a sudden change of wind stress N86-15698
A numerical modelling of the seasonal variation of the tropical Pacific sea surface temperature N86-15699
A numerical simulation of coastal mixed layer by a modified 1-D DKT model N86-15700
A numerical model of the turbulent boundary layer beneath surface waves and tides [IOS-196] N86-15854
An operational wave model for the North Atlantic Ocean [KNMI-WR-85-3] N86-15857

OCEAN SURFACE
A numerical study on the response of the tropical Pacific sea surface temperature to a sudden change of wind stress N86-15698
A numerical modelling of the seasonal variation of the tropical Pacific sea surface temperature N86-15699
Development of slope spectra of the wind-disturbed water surface N86-15842
The TMA shallow-water spectrum description and applications [AD-A157975] N86-15844
Wave and surf forecast model evaluation for use on a micro computer [AD-A159063] N86-15848
A re-analysis of SWOP data --- Stereo Wave Observation Project (SWOP) [IOS-195] N86-15853
A numerical model of the turbulent boundary layer beneath surface waves and tides [IOS-196] N86-15854
An operational wave model for the North Atlantic Ocean [KNMI-WR-85-3] N86-15857

OCEAN TEMPERATURE
Geophysical Bulletin of Hokkaido University, no. 46 [ISSN-0439-3503] N86-15695
A numerical study on the response of the tropical Pacific sea surface temperature to a sudden change of wind stress N86-15698
A numerical modelling of the seasonal variation of the tropical Pacific sea surface temperature N86-15699
A numerical simulation of coastal mixed layer by a modified 1-D DKT model N86-15700
Towed thermistor chain observations during MILDEX (Mixed Layer Dynamics Experiment) [AD-A158304] N86-15847

OCEAN THERMAL ENERGY CONVERSION
165-kW open-cycle OTEC experiment [DE85-008818] N86-15735

OCEANOGRAPHIC PARAMETERS
SAR (Synthetic Aperture Radar) data collection and processing summary - 1984 SARSEX (SAR internal wave signature experiment) experiment [AD-A159440] N86-15530
Mizlant 84 data report results of an oceanographic cruise to the Greenland Sea, August-September 1984 [AD-A157997] N86-15845
Towed thermistor chain observations during MILDEX (Mixed Layer Dynamics Experiment) [AD-A158304] N86-15847
The CTD data from the Northeast Atlantic 22 N-33 N, 19 W-24 W, July 1983. Discovery cruises 138, 139. --- conductivity, temperature, depth (CTD) [IOS-188] N86-15850

CTD data from the Northeast Atlantic Ocean 40-48 N, 12-21 W collected on RRS DISCOVERY cruise 132 in February 1983 --- conductivity, temperature, depth (CTD) [IOS-192] N86-15851

The IOS geophysical data held on magnetic tape - summary. Bathymetric, magnetic and gravity data collected during marine geology and geophysics cruises 1973 - 1984 [IOS-194] N86-15852

OCEANOGRAPHY

A review of biological processes within oceanic water columns relevant to the assessment of the safety of disposal of waste, notably radioactive isotopes, on or within the seabed [IOS-198] N86-15745

The effect of the Benthic Boundary Layer on the physics of intense mesoscale eddies N86-15751

Towed thermistor chain observations during MILDEX (Mixed Layer Dynamics Experiment) [AD-A158304] N86-15847

OCEANS

SAR (Synthetic Aperture Radar) data collection and processing summary - 1984 SARSEX (SAR internal wave signature experiment) experiment [AD-A159440] N86-15530

Satellite passive microwave rain measurement techniques for land and ocean N86-15799

ODORS

Functional state of the olfactory analyzer in a pressurized environment N86-15890

OGIVES

The experimental determination of the subsonic aerodynamic characteristics of an Ogive-Cylinder body including a comparison with theoretical estimates, volume 1 [CAR-8509] N86-15242

OHIO

Water resources data for Ohio, water year 1984. Volume 2: St. Lawrence River Basin, statewide project data [PB85-230233] N86-15719

ON-LINE SYSTEMS

Cooperative VAS program with NASA Marshall Space Flight Center N86-15804

ONE DIMENSIONAL FLOW

Transient three phase, three component flow. Part 2: One-dimensional slip model, comparison theory-experiment [KFK-3926-PT-2] N86-15646

OPERATING SYSTEMS (COMPUTERS)

Robotron hardware compatible programming languages surveyed N86-15474

OPERATIONAL CALCULUS

Operational methods for data interpolation [DE85-016050] N86-15969

OPERATIONS RESEARCH

The equal flow problem [AD-A159594] N86-16028

Queueing network systems with unbalanced flows and their applications to performance evaluation of highly parallel distributed information systems: Revision [AD-A158052] N86-16154

OPERATORS (MATHEMATICS)

A preliminary report on some recent results in born inversion [AD-A158926] N86-15958

Outer product calculations [AD-A158295] N86-15991

OPTICAL COMMUNICATION

Selection of signals for digital optical channel N86-15471

Efficiency of coherent reception of optical signal propagating through turbulent atmosphere N86-15472

OPTICAL EQUIPMENT

Generation of electromagnetic radiation in radio-frequency band in solids exposed to laser radiation N86-15509

Droplet sizing research [AD-A158318] N86-15653

Interface alignment system [AD-D011896] N86-16087

OPTICAL FILTERS

Properties of optical filters on CdSe-HgSe base N86-15506

Color-encoding raster light filters for single-tube color television cameras N86-15580

OPTICAL MEASURING INSTRUMENTS

Analysis of automated light guide pulse dispersion measurement N86-15605

OPTICAL PATHS

Athermal conditions of optical elements and properties of optical materials N86-15423

Wavelength selective demultiplexer tuner [AD-D011890] N86-15532

Interface alignment system [AD-D011896] N86-16087

OPTICAL PROPERTIES

Microstructures built from electroactive polymers: Toward a macromolecular electronics [AD-A159430] N86-15400

Development of radiative cooling materials, phase 3 [DE85-014666] N86-15404

Bulletin of the Faculty of Engineering, Hokkaido University, no. 128 [ISSN-0385-602X] N86-15420

Athermal conditions of optical elements and properties of optical materials N86-15423

Integrating sphere spectrometer for high-temperature materials characterization [DE85-012170] N86-15656

Beta alumina: A solid-electrolyte as a solid-state laser host [AD-A159409] N86-15664

Effect of optical injection on the optical properties of a (GaAl)As semiconductor laser: Optical bistability and four wave mixing [ENST-85E005] N86-15667

Optical characteristics of lightning N86-15789

Droplet size and evaporation rate within a two-phase flow by morphology-dependent resonances in the optical spectra [AD-A158931] N86-16091

Superlattice optical bistability research [AD-A158876] N86-16128

OPTICAL PUMPING

Structural transformations in semiconductors during optical pumping N86-15490

Plasmas as light sources for lasers [AD-A159460] N86-15666

Effect of optical injection on the optical properties of a (GaAl)As semiconductor laser: Optical bistability and four wave mixing [ENST-85E005] N86-15667

OPTICAL RADAR

Multiscale modeling to evaluate proposed space-based Doppler lidar sampling strategies N86-15774

Airborne Doppler measurements of the central California extended sea breeze N86-15791

Analysis of Doppler lidar data N86-15792

Airborne Doppler lidar activities N86-15793

OPTICAL RESONATORS

Frequency characteristics of differential optron N86-15497

OPTICAL SCANNERS

Integrating sphere spectrometer for high-temperature materials characterization [DE85-012170] N86-15656

OPTICAL TRANSFER FUNCTION

LANDSAT-4 Thematic Mapper Modulation Transfer Function (MTF) evaluation [E86-10017] N86-15710

OPTICAL WAVEGUIDES

Digital television routing systems: An introduction to integrated optical waveguide techniques and devices [BBC-RD-1985/9] N86-15515

Analysis of automated light guide pulse dispersion measurement N86-15605

The Surface Acoustic Wave (SAW) chemisensor. Part 1: A literature review [PML-1985-3-PT-1] N86-15649

OPTIMAL CONTROL

PIFCGT: A PIF autopilot design program for general aviation aircraft [NASA-CR-166123] N86-15320

On the optimal control of bilinear systems and its relation to Lie algebras [RR-275] N86-15980

On the optimal control of nonlinear systems [RR-278] N86-15981

OPTIMIZATION

An experimental study of an ultra-mobile vehicle for off-road transportation. Appendix 2. Dissertation. Kinematic optimal design of a six-legged walking machine [AD-A159147] N86-15434

Optimum frequency of communication channel for indoor radio telemetry N86-15493

Optimization of a magnet circuit design for a cylindrical mass spectrometer [NASA-CR-176400] N86-15543

An interactive discrete controls analysis option (ORACLS) for the CONTROLS analysis package on the IBM 3033 [AD-A158754] N86-15956

LaPlace transformation with REDUCE 2 [INPE-3849-PRE/816] N86-15985

Rapidly convergent algorithms for nonsmooth optimization [AD-A159168] N86-16005

The equal flow problem [AD-A159594] N86-16028

Optimum frequency for propagation of sound in shallow sound channels [AD-A159064] N86-16047

ORBITAL RENDEZVOUS

Space station propulsion requirements study [NASA-CR-174934] N86-15339

ORBITS

Measuring the orbit length of the Tevatron [DE85-017443] N86-16079

ORDER-DISORDER TRANSFORMATIONS

First-principles calculation of the magnetic properties of paramagnetic fcc iron [DE85-017155] N86-16035

ORGANIC COMPOUNDS

Variability of major organic components in aircraft fuels [AD-A159057] N86-15415

ORGANIC MATERIALS

Collection and analysis of NASA clean room air samples [NASA-CR-3947] N86-15358

ORGANOMETALLIC COMPOUNDS

USSR report: Chemistry [JPRS-UCH-85-013] N86-15344

ORIFICES

Programming a multiple-orifice hydraulic decelerator [AD-A159428] N86-15328

ORTHOGONALITY

Modal analysis of unstable resonators [AD-A159225] N86-15663

ORTHOSTATIC TOLERANCE

Investigation of some aspects of human amino acid metabolism during 120-day antiorthostatic hypokinesia N86-15873

OSCILLATION DAMPERS

The dynamic response of discretely damped structures under harmonic and random excitation [R-475] N86-15686

OSCILLATIONS

Influence of higher types of oscillations on piston-tuned waveguide Gunn oscillator frequency N86-15611

A graphical similarity measure for time series models [AD-A158869] N86-15996

OSCILLATORS

Use of active quenching for reduction of power dissipation in dipole antenna array N86-15460

Nonsinusoidal modes of oscillator with multifrequency surface-acoustic-wave resonator N86-15488

External locking of IMPATT-diode power oscillators N86-15618

OUTPUT

Visual display parameters [AD-A158773] N86-15654

Variable radix processor [AD-D011893] N86-15918

OXIDATION

Novel approaches to passivation of Si for VHSIC - based on fundamental studies [AD-A158238] N86-15546

Degradation of surface-acoustic-wave resonators N86-15573

Intensity of lipid peroxidation in hypokinetic rat tissues N86-15876

Selective anodic oxidation of semiconductors for pattern generation [AD-D011889] N86-16133

OXIDATION-REDUCTION REACTIONS

Redox capacity and dc electron conductivity in electroactive materials [AD-A159431] N86-15401

A two-terminal microelectrochemical diode with contact spacing of about one micron. A device based on one solution redox couple and one electrode-confined redox couple [AD-A158774] N86-15553

Micron-spaced platinum interdigitated array electrode: Fabrication, theory and initial use [AD-A159429] N86-15556

OXIDE FILMS

Fluidized reduction of oxides on fine metal powders without sintering [NASA-TM-77928] N86-15379

OXYGEN

Moldable electrically conductive polymer compositions [AD-D011887] N86-15402

The twilight sodium layer [INPE-3566-PRE/773] N86-15754

Auroral thermosphere temperatures from observations of 6300 A emissions [NASA-TM-86530] N86-15755

OXYGEN CONSUMPTION

Oxygenation and regional circulation in gingival mucosal tissues under effect of head-to-pelvis (+Gz) accelerations N86-15872

OZONE
The twilight sodium layer
[INPE-3568-PRE/773] N86-15754
OZONOMETRY
Measurements of statospheric ozone by indigo decoloration N86-15763

P

P-N JUNCTIONS
Investigation of reverse branch of voltage-current curve of GaAs high-voltage p-n structure N86-15614
External locking of IMPATT-diode power oscillators N86-15618
PACIFIC ISLANDS
Tahiti Island Pacific limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159607] N86-15832
PACIFIC OCEAN
Geophysical Bulletin of Hokkaido University, no. 46
[ISSN-0439-3503] N86-15695
A numerical study on the response of the tropical Pacific sea surface temperature to a sudden change of wind stress N86-15698
A numerical modelling of the seasonal variation of the tropical Pacific sea surface temperature N86-15699
A numerical simulation of coastal mixed layer by a modified 1-D DKT model N86-15700
Application of satellite data to tropic/subtropic moisture coupling N86-15780
Response of the mesoscale atmosphere to diabatic heating N86-15794
Tahiti Island Pacific limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159607] N86-15832
Towed thermistor chain observations during MILDEX (Mixed Layer Dynamics Experiment)
[AD-A158304] N86-15847
Optimum frequency for propagation of sound in shallow sound channels
[AD-A159064] N86-16047
PACKET SWITCHING
Specific recommendations for improving network feedback to hosts
[AD-A158768] N86-15924
PACKET TRANSMISSION
Efficiency of storing pulse products in coherent signal packets N86-15584
PACKETS (COMMUNICATION)
Specific recommendations for improving network feedback to hosts
[AD-A158768] N86-15924
PACKING DENSITY
Random sequential coding by hamming distance
[AD-A158003] N86-15989
PALEOMAGNETISM
Paleomagnetism and tectonics of the central and eastern Transverse Ranges, Southern California N86-15747
PARABOLAS
A rapid method for estimating equivalent parabolic polars from wind-tunnel tests
[AD-A159559] N86-15251
PARABOLIC DIFFERENTIAL EQUATIONS
Nonlinear diffusion equations
[AD-A158305] N86-15992
PARALLEL PROCESSING (COMPUTERS)
Binocular image flows: Steps toward stereo - motion fusion
[AD-A158089] N86-15901
Multiprocessor systems with dynamic redistribution of requests through a common bus N86-15933
Cybernetics Institute develops parallel-processing computer N86-15936
Hypercube concurrent computation and virtual time for robotic application
[DE85-009479] N86-15979
PARALLEL PROGRAMMING
USSR report: Cybernetics, computers and automation technology
[JPRS-UCC-85-004] N86-15927
Organization of processor oriented to multiprocessing N86-15931
PARAMECIA
Investigations of the effects of gravity on Paramecium caudatum structure and behavior
[DFVLR-FB-85-40] N86-15863
PARAMETER IDENTIFICATION
Programs to compute the Circular Error Probability (CEP) of a location system with direction finding stations
[FEL-1985-20] N86-15538
Estimating number and parameters of signal components in presence of noise N86-15567
Balancing of a rod using a digitally controlled robot
[DFVLR-FB-85-41] N86-15677
Control and identification of time varying systems
[AD-A159067] N86-15999
A lower confidence bound on the probability of a correct selection
[AD-A159164] N86-16023
A computer program for analyzing loglinear models with latent variables: LCAG N86-16026
Estimation of the trajectory parameters of an accelerationless target from angle measurements of a single, stationary, acoustic sensor. Error sources and their influence
[REPT-12-84] N86-16039
PARAMETERIZATION
Predicting and diagnosing performance of transistors, integrated circuits and large-scale-integration systems by multilevel simulation methods and programs N86-15487
Response of the mesoscale atmosphere to diabatic heating N86-15794
PARASITIC DISEASES
Anti-trypanosomal activity of platinum coordination compounds
[AD-D011860] N86-15897
PARTIAL DIFFERENTIAL EQUATIONS
Stochastic differential equations for neuronal behavior
[AD-A159099] N86-15908
Numerical methods for singularly perturbed differential equations with applications
[AD-A158969] N86-15997
PARTICLE ACCELERATION
Superconducting linacs: Some recent developments
[DE85-014972] N86-16081
Generation of ion beams in plasma focus N86-16102
PARTICLE ACCELERATOR TARGETS
Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams
[IPPJ-742] N86-16096
Alpha-burning in ICF target N86-16109
Target imposion in LIB ICF N86-16110
Proposal of power plant by LIB fusion N86-16113
PARTICLE ACCELERATORS
TOM: A program for interactive lattice design
[DE85-016988] N86-16077
Measuring the orbit length of the Tevatron
[DE85-017443] N86-16079
PBFA-2 vacuum system design using a lumped parameter computer model
[DE85-013117] N86-16125
PARTICLE EMISSION
Self-quenching streamer discharge characteristics at extreme gas compositions N86-15442
PARTICLE INTERACTIONS
Mechanisms of excitation and ionization processes in sputtering
[AD-A158061] N86-15361
PARTICLE MASS
The movement of a cluster of particles subject to the effect of gravity and their sedimentation onto a plane horizontal surface
[BLL-RISLEY-TR-5161-(9091.9F)] N86-15623
PARTICLE SIZE DISTRIBUTION
Effects of vibration-induced cavitation of physicochemical characteristics of aircraft fuel N86-15346
Burning time and size of aluminum, magnesium, zirconium, tantalum, and pyrofuze particles burning in steam
[AD-A159161] N86-15366
Particle sizing with whisker collectors --- flow visualization
[ISL-CO-230/84] N86-15639
Droplet sizing research
[AD-A158318] N86-15653
Ultrasonic measurement of particles in a viscous fluid
[AD-A158989] N86-16046
PARTICLE THEORY
Does one need a fourth generation of leptons
[PREPRINT-461] N86-16071
PARTICLE TRACKS
Time-resolved measurement of energy and species of an intense pulsed ion beam N86-16104
PARTICLE TRAJECTORIES
Photographic recording of trajectories of aerosol particles by method of multiple exposure N86-15613
PARTICLES
Predictive models for gaseous-phase carbon adsorption and humidity effects on trichloroethylene adsorption
[AD-A159167] N86-15367
PASCAL (PROGRAMMING LANGUAGE)
An implementation in Pascal: Translation of Prolog into Pascal
[AD-A159552] N86-15965
PASSIVE SATELLITES
Severe storm identification with satellite microwave radiometry: An initial investigation with Nimbus-7 SMMR data
[NASA-CR-176431] N86-15821
PASSIVITY
Surface passivation of semiconductor circuit elements with layer of wideband semiconductor N86-15485
PATENT POLICY
China report: Science and technology
[JPRS-CST-85-040] N86-15478
NASA patent abstracts bibliography: A continuing bibliography. Section 1: Abstracts (supplement 26)
[NASA-SP-7039(26)-SECT-1] N86-16151
PATTERN RECOGNITION
Peat landforms along the Albany River, northern Ontario. An ecological study of peat landforms in Canada and Alaska
[E86-10014] N86-15704
Possibility of artificial intelligence in computers N86-15944
Belorussian computer speaks, reads graphics, X-rays N86-15945
Large memory acousto-optically addressed pattern recognition
[AD-D011861] N86-16092
PAVEMENTS
Concepts for the development of a nondestructive testing and evaluation system for rigid airfield pavements
[AD-A158004] N86-15324
PAYLOAD INTEGRATION PLAN
Space shuttle/mesoscale lightning experiment N86-15787
PAYLOADS
Space activities of the United States, Soviet Union and other launching countries/organizations, 1957-1984
[GPO-46-504] N86-15330
PEAT
Peat landforms along the Albany River, northern Ontario. An ecological study of peat landforms in Canada and Alaska
[E86-10014] N86-15704
PENDULUMS
Triple pendulum for the demonstration of nonlinear coupling
[LAB-REPT-763] N86-16032
Triple pendulum for the demonstration of nonlinear coupling N86-16033
A multiple pendulum for the demonstration of nonlinear coupling N86-16034
PENETRATION
Effects of waves on the boundary layer of a surface-piercing body
[AD-A158053] N86-15633
Steady state penetration of rigid perfectly plastic targets
[AD-A158081] N86-15670
PEPTIDES
United States Air Force Academy, Department of Chemistry Research: AY 1983-1984
[AD-A159319] N86-15343
PERCOLATION
Energy function and conductivity of metal-polymer composites N86-15347
PERFORMANCE PREDICTION
Aircraft flight performance methods. Revision 2
[AD-A158227] N86-15310
Techniques for fatigue life predictions from measured strains. Appendix E: HPOTP bearing cartridge and MCC coolant inlet duct power spectral densities
[NASA-CR-178515] N86-15689
PERFORMANCE TESTS
Ceramic automotive Stirling engine study
[NASA-CR-174907] N86-16165
PERIODIC FUNCTIONS
Strip and microstrip line periodic heterogeneities N86-15608
An algorithm for active adaptive control of periodic interference
[AD-A156651] N86-16052
PERIODIC VARIATIONS
Systematic and random variations in digital Thematic Mapper data
[E86-10018] N86-15711
Climatological data of stations in the Netherlands. No. 24: A climatology of Amsterdam airport for the period 1951 - 1980
[KNMI-150-24] N86-15837
PERIPHERAL EQUIPMENT (COMPUTERS)
Wide-band single-board analog-digital converter N86-15935
PERMAFROST
Design of foundations in permafrost
[AD-A158063] N86-15433

PERMEABILITY
The permeability and consolidation of deep sea sediments
[IOS-201] N86-15855
PETROS: A progam for calculating transport of heat, water, water vapor and air through a porous material
[DE85-013168] N86-15972
PERMITTIVITY
Multilayer volume microwave filters N86-15465
Mixing formulas and experimental results of the dielectric constant of snow
[REPT-S-158] N86-15717
Research on the crystal growth and dielectric properties of high permittivity ferroelectric materials
[AD-A157820] N86-16126
PEROXIDES
Reactions of singlet oxygen with enol esters
[AD-A159160] N86-15342
Intensity of lipid peroxidation in hypokinetic rat tissues N86-15876
PERSONNEL
Implementation of multifunction information systems at three Navy facilities
[AD-A157797] N86-16153
PERSONNEL SELECTION
Experience and performance in video games and its influence on aptitude tests in aviation psychology
[DFVLR-FB-85-43] N86-15915
PERTURBATION THEORY
Numerical methods for singularly perturbed differential equations with applications
[AD-A158969] N86-15997
PETROLOGY
Geology, petrology, and geochemistry of a younger granite pluton, central Eastern Desert of Egypt; importance of mixing N86-15746
PHARMACOLOGY
East Europe report: Science and technology
[JPRS-ESA-85-037] N86-15408
PHASE CONJUGATION
Effectiveness of phase-conjugation systems in turbulent atmosphere N86-15513
PHASE DEMODULATORS
Acoustooptic demodulator of phase-keyed signals N86-15622
PHASE LOCKED SYSTEMS
Coupled high power waveguide laser research
[AD-A159079] N86-15662
PHASE MODULATION
Nonsinusoidal modes of oscillator with multifrequency surface-acoustic-wave resonator N86-15488
PHASE SHIFT CIRCUITS
Investigations and comparisons of new types of millimetre-wave planar arrays using microstrip and dielectric structures
[AD-A158313] N86-15522
Power combinations microwave amplifier loading characteristics N86-15610
PHASE SHIFT KEYING
A brief investigation of adaptive decision feedback equalization for digital HF links employing PSK (Phase Shift Keying) modulation
[AD-A157809] N86-15545
Acoustooptic demodulator of phase-keyed signals N86-15622
PHASE TRANSFORMATIONS
Scientists cite uses of cryogenics, low temperature measurement N86-15477
PHASED ARRAYS
Development and evaluation of a regional seismic array in Norway
[AD-A159129] N86-15761
PHENOLOGY
Biochemical processes in sagebrush ecosystems: Interactions with terrain
[E86-10015] N86-15705
PHONONS
Submicron phonics 1
[AD-A159421] N86-16131
PHOTOCHEMICAL REACTIONS
United States Air Force Academy, Department of Chemistry Research: AY 1983-1984
[AD-A159319] N86-15343
The twilight sodium layer
[INPE-3568-PRE/773] N86-15754
PHOTOCONDUCTIVITY
Extension of electronic transport properties of polymer dielectrics to severe environments encountered in systems
[DE85-017321] N86-15406
Picosecond photoconductivity of indium aresenide N86-15596
PHOTOCONDUCTORS
Theoretical model of Hg(1-x)Cd(x)Te photovoltaic and photoconductive infrared detectors
[AD-A158668] N86-15551
PHOTOELECTRIC CELLS
Influence of embedded electrical fields on temperature stability of parameters of I-Ga-As heterophotoelements N86-15615
PHOTOELECTRIC EFFECT
Characteristics of electrophysical and photoelectric properties of MOS-structures on indium arsenide N86-15486
PHOTOELECTRIC EMISSION
Self-guarding Schottky barrier infrared detector array
[AD-D011894] N86-15541
PHOTOELECTRICITY
Wavelength error analysis in a multiple-beam Fizeau laser wavemeter having a linear diode array readout
[NASA-TM-87614] N86-16089
PHOTOGRAPHIC RECORDING
Photographic recording of trajectories of aerosol particles by method of multiple exposure N86-15613
PHOTOGRAPHS
Droplet sizing research
[AD-A158318] N86-15653
PHOTOGRAPHY
Luminescence photography N86-15582
PHOTOLUMINESCENCE
Photoluminescent response of palladium-cadmium sulfide and palladium-graded cadmium sulfoselenide Schottky diodes to molecular hydrogen
[AD-A158759] N86-15552
PHOTONICS
Frequency characteristics of differential optron N86-15497
Development of a photonic data recorder
[DE85-017120] N86-15655
Self-consistent approximation for squeezing generation in a nonlinear optical medium
[NOTA-INTERNA-845] N86-16094
PHOTOSYNTHESIS
Application of electron-transfer theory to several systems of biological interest
[DE85-015835] N86-15860
PHOTOVOLTAIC EFFECT
Theoretical model of Hg(1-x)Cd(x)Te photovoltaic and photoconductive infrared detectors
[AD-A158668] N86-15551
PHYSICAL CHEMISTRY
Effects of vibration-induced cavitation of physicochemical characteristics of aircraft fuel N86-15346
PHYSICIANS
East Europe report: Science and technology
[JPRS-ESA-85-037] N86-15408
PHYSICS
China report: Science and technology
[JPRS-CST-85-038] N86-15438
PHYSIOLOGICAL EFFECTS
Basic results of experiments with long-term rotation of rats as applied to the problem of artificial gravity N86-15878
One aspect of crew training N86-15885
PHYSIOLOGICAL RESPONSES
The Middle Latency Response (MLR) and Steady State Evoked Potential (SSEP) in neonates
[AD-A158007] N86-15900
PICOSECOND PULSES
Picosecond photoconductivity of indium aresenide N86-15596
PIEZOELECTRIC TRANSDUCERS
Elastohydrodynamic studies using thin film transducers
[RP-666] N86-15648
PIEZOELECTRICITY
Demonstration of a pyroelectric conversion power cycle with a polymer
[AD-A158964] N86-15398
PILOT PERFORMANCE
Problems of studying flight work in Soviet aviation medicine of the 1920's - 1930's N86-15866
Investigation of factors determining pilot's geocentric orientation N86-15868
Effect of threat stress on psychomotor stability of pilots differing in anxiety level N86-15869
Use of flight simulators for demonstration of functional capacities of flight personnel N86-15870
Effect of level of physical activity on lipid metabolism of flight personnel N86-15871
PILOTS (PERSONNEL)
Comparison of the Air Force female and male pilot grounded time in the Air Force Military Airlift Command
[AD-A158093] N86-15902
Visual sensitivities and discriminations and their roles in aviation
[AD-A158962] N86-15907
PIONS
GGLP effect from 1959 to 1984
[DE85-011981] N86-16069
PIPE FLOW
New experimental techniques for probing gun barrel boundary layers
[ISL-CO-234/84] N86-15640
PIPELINING (COMPUTERS)
Silicon compiler design of combinational and pipeline adder integrated circuits
[AD-A158995] N86-15555
PISTON THEORY
Influence of higher types of oscillations on piston-tuned waveguide Gunn oscillator frequency N86-15611
PISTONS
Programming a multiple-orifice hydraulic decelerator
[AD-A159428] N86-15328
PITCH
Experimentally determined flutter from two- and three-bladed model bearingless rotors in hover N86-15286
PITCH (INCLINATION)
A review of dynamic inflow and its effect on experimental correlations N86-15293
PITCHING MOMENTS
Prediction of wing aeroelastic effects on aircraft lift and pitching moment characteristics
[NASA-TM-87631] N86-15319
PLANAR STRUCTURES
Investigations and comparisons of new types of millimetre-wave planar arrays using microstrip and dielectric structures
[AD-A158313] N86-15522
PLANE WAVES
Scattering by cylinder with anisotropic impedance N86-15456
Use of active quenching for reduction of power dissipation in dipole antenna array N86-15460
PLANETARY ATMOSPHERES
Solution to reverse refraction problem N86-15562
PLANETARY BOUNDARY LAYER
Mesoscale ageostrophic circulations associated with baroclinic jet streaks N86-15795
PLANETARY EVOLUTION
Further explorations of cosmogonic shadow effects in the Saturnian rings
[NASA-CR-176441] N86-16177
PLANETARY MAPPING
Venus-15, Venus-16 synthetic aperture radar on Venus satellite orbit N86-15510
PLANETARY WAVES
Theoretical and experimental studies of baroclinic processes N86-15770
Theoretical and experimental studies in support of the Geophysical Fluid Flow Experiment N86-15772
Utilization of satellite cloud information to diagnose the energy state and transformations in extratropical cyclones N86-15778
Dynamics and structure of Gulf Stream meanders northeast of Cape Hatteras, N.C. N86-15841
PLANNING
Possibilities at LAMPF for studying nuclei of astrophysical interest
[DE85-017526] N86-16173
PLANTS (BOTANY)
Investigation of microflora of chufa, a potential higher plant component of biological life-support systems for man N86-15882
PLASMA CLOUDS
Transverse motion of high speed barium clouds in the ionosphere
[AD-A159058] N86-15760
PLASMA CONTROL
Investigation of diode physics using an annular magnetically insulated ion diode operated in long pulse mode N86-16097
PLASMA DIAGNOSTICS
Plasma parameters at low level of intrinsic microwave radiation N86-15466
Research and development of an aimed magnetic lead current density-magnetic field diagnostic
[DE85-014720] N86-16060
Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams
[IPPJ-742] N86-16096
Laser intracavity absorption as a plasma diagnostic aid
[DE85-015741] N86-16120
PLASMA DRIFT
Transverse motion of high speed barium clouds in the ionosphere
[AD-A159058] N86-15760
PLASMA FOCUS
Generation of ion beams in plasma focus N86-16102
PLASMA GENERATORS
Miniature plasma accelerating detonator and method of detonating insensitive materials
[DE85-017747] N86-15418

Plasmas as light sources for lasers
[AD-A159460] N86-15666

PLASMA HEATING
Project HERO: Heating Rocket Experiments. The H and E field probe (HESO): In situ measurements of plasma parameters in the ionospheric plasma modified by electromagnetic waves of high intensity
[BMFT-FB-W-85-009] N86-15766

PLASMA JETS
Melting and consolidation of nickel alloy powders with a plasma jet operating in a low pressure inert environment N86-15374
Experimental studies of L shell X-ray emission from high density plasmas N86-16095

PLASMA PHYSICS
Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams
[IPPJ-742] N86-16096

PLASMA POWER SOURCES
Plasmas as light sources for lasers
[AD-A159460] N86-15666
Nonlinear analysis of a relativistic beam-plasma cyclotron instability
[AD-A159159] N86-16115

PLASMA RADIATION
Plasma parameters at low level of intrinsic microwave radiation N86-15466

PLASMA WAVES
Lower hybrid parametric processes on auroral field lines in the topside ionosphere
[UIO-SR-85-03] N86-15764
Project HERO: Heating Rocket Experiments. The H and E field probe (HESO): In situ measurements of plasma parameters in the ionospheric plasma modified by electromagnetic waves of high intensity
[BMFT-FB-W-85-009] N86-15766

PLASMA-ELECTROMAGNETIC INTERACTION
Nonlinear analysis of a relativistic beam-plasma cyclotron instability
[AD-A159159] N86-16115
Cosmogonic scenario
[TRITA-EPP-85-04] N86-16175

PLASMAS (PHYSICS)
Miniature plasma accelerating detonator and method of detonating insensitive materials
[DE85-017747] N86-15418
Plasmas as light sources for lasers
[AD-A159460] N86-15666
Transverse motion of high speed barium clouds in the ionosphere
[AD-A159058] N86-15760
Solution of the field equations for 2-D electromagnetic direct implicit plasma simulation
[DE85-016073] N86-16123

PLASTIC DEFORMATION
Microstructural origins of hot spots in RDX explosive and several reference inert materials
[AD-A158223] N86-15413

PLASTIC PROPERTIES
Limit analysis of transversely loaded grillages
[AD-A158988] N86-15692

PLASTICIZERS
Extrusion cast explosive
[DE85-017785] N86-15417

PLATES (STRUCTURAL MEMBERS)
Stress concentration around a small circular hole in the HiMAT composite plate
[NASA-TM-86038] N86-15350

PLATES (TECTONICS)
Paleomagnetism and tectonics of the central and eastern Transverse Ranges, Southern California N86-15747

PLATINUM
Micron-spaced platinum interdigitated array electrode: Fabrication, theory and initial use
[AD-A159429] N86-15556

PLATINUM COMPOUNDS
Anti-trypanosomal activity of platinum coordination compounds
[AD-D011860] N86-15897

PLUMES
Development of packed-tower air strippers for trichloroethylene removal at Wurtsmith Air Force Base, Michigan
[AD-A159139] N86-15326
Monitoring of hot water plume movements in an aquifer with borehole/surface resistivity measurements
[DE85-014531] N86-15637

PLUTONIUM 239
Mean fission neutron spectrum energies for (252) Cf and fissile nuclides, (233)U, (235)U, (239)Pu and (241)Pu
[DE85-013298] N86-16086

PLUTONIUM 241
Mean fission neutron spectrum energies for (252) Cf and fissile nuclides, (233)U, (235)U, (239)Pu and (241)Pu
[DE85-013298] N86-16086

PNEUMATIC CONTROL
Dynamic response characteristics of a circulation control rotor model pneumatic system N86-15298

POINT SOURCES
Determination of point source image field structure by real radiooptical antenna N86-15564

POINTS (MATHEMATICS)
Tests for a change-point
[AD-A159381] N86-16025

POISSON DENSITY FUNCTIONS
Mathematical problems in stability, control and reliability of random access communication systems
[AD-A159402] N86-15529

POISSON RATIO
Spring stiffnesses for beam-column analysis of soil-structure interaction problems
[AD-A158072] N86-15690

POLAR REGIONS
Design of foundations in permafrost
[AD-A158063] N86-15433

POLARIZATION (WAVES)
Ionosphere influence on MHD wave bundle propagation N86-15570

POLARIZED ELECTROMAGNETIC RADIATION
Longitudinally slotted cylindrical shield with finite thickness and electrical conductance N86-15463

POLICIES
Controlling acidic deposition: Targeted strategies for reducing sulfur dioxide emissions
[DE85-015058] N86-15742

POLISHING
Metallographic preparation of particulate filled aluminum metal matrix composite material
[AD-D011862] N86-15352
Generation of electromagnetic radiation in radio-frequency band in solids exposed to laser radiation N86-15509

POLLUTION CONTROL
Controlling acidic deposition: Targeted strategies for reducing sulfur dioxide emissions
[DE85-015058] N86-15742
Proposals for acid-rain control from the 98th Congress
[DE85-015268] N86-15744

POLLUTION TRANSPORT
Collection and analysis of NASA clean room air samples
[NASA-CR-3947] N86-15358
Approach to uncertainty assessment for fluid flow and contaminant transport modeling in heterogeneous groundwater systems
[DE85-016621] N86-15714
Controlling acidic deposition: Targeted strategies for reducing sulfur dioxide emissions
[DE85-015058] N86-15742

POLYCRYSTALS
Structural and electrical characterization of polycrystalline semiconductor materials
[DE85-012166] N86-16135

POLYMER CHEMISTRY
Extension of electronic transport properties of polymer dielectrics to severe environments encountered in systems
[DE85-017321] N86-15406
Use of new polyurethane in leather substitute N86-15410

POLYMER MATRIX COMPOSITES
Energy function and conductivity of metal-polymer composites N86-15347
Mechanical properties testing of candidate polymer matrix materials for use in high performance composites
[NASA-CR-177970] N86-15349
Moldable electrically conductive polymer compositions
[AD-D011887] N86-15402

POLYMER PHYSICS
Studies of molecular properties of polymeric materials: Aerospace environmental effects on three linear polymers
[NASA-TM-87532] N86-15391
Studies of molecular properties of polymeric materials: Aerospace environmental effects on three linear polymers (polymer durability) N86-15392
Radio-frequency electrical properties of some neat and metal-doped polyimides N86-15393

POLYMERIZATION
USSR report: Chemistry
[JPRS-UCH-85-013] N86-15344
Electrolysis of CO(2) by novel metallopolymeric cathodes
[AD-A158228] N86-15364
Redox capacity and dc electron conductivity in electroactive materials
[AD-A159431] N86-15401
Antimisting kerosene: Development of a continuous 10 GPM in-line blender
[NASA-CR-176432] N86-15412

POLYMERS
Formation of volatile substances during polymer destruction by Pseudomonas aeruginosa N86-15884

POLYNOMIALS
Accuracy of polynomial approximation of quasi-minimax methods N86-15427
Analysis of drops in accuracy of least-squares approximation N86-15428
An exact algorithm for the knapsack problem
[INPE-3645-PRE/815] N86-15984

POLYPROPYLENE
Development of packed-tower air strippers for trichloroethylene removal at Wurtsmith Air Force Base, Michigan
[AD-A159139] N86-15326

POLYSTYRENE
Configurational diffusion in semidilute solutions
[DE85-017121] N86-15405

POLYURETHANE FOAM
East Europe report: Science and technology
[JPRS-ESA-85-037] N86-15408

POLYURETHANE RESINS
Use of new polyurethane in leather substitute N86-15410

POPULATION INVERSION
The parameters of adiabatic rapid passage in the 0-0 hyperfine transition of Rb-87
[AD-A158562] N86-16056

POPULATION THEORY
A lower confidence bound on the probability of a correct selection
[AD-A159164] N86-16023

POROSITY
The catalytic activity and selectivity of chemical treated clinoptilolite in the conversion of methanol N86-15424
Ultrasonic characterization of porosity using the Kramers-Kronig relations
[DE85-017346] N86-16051

POROUS MATERIALS
PETROS: A progam for calculating transport of heat, water, water vapor and air through a porous material
[DE85-013168] N86-15972

PORTS (OPENINGS)
Resonant cavities for stall recovery in gas turbine engines
[AD-D011891] N86-15317

POSITION (LOCATION)
Optimum frequency of communication channel for indoor radio telemetry N86-15493
Wavelength selective demultiplexer tuner
[AD-D011890] N86-15532
Location of noise sources using a phase-slope method
[NASA-TP-2505] N86-16041

POSITION ERRORS
Programs to compute the Circular Error Probability (CEP) of a location system with direction finding stations
[FEL-1985-20] N86-15538

POSITIONING DEVICES (MACHINERY)
Adapter pallet system
[AD-D011858] N86-15671

POSITRON ANNIHILATION
Hydrogen diffusion, positron annihilation in 40CrNiMo steel N86-15439
Search for positron annihilation line and continuum radiation from the Galactic Center
[DE85-013964] N86-16169

POTASSIUM HYDROXIDES
Chemiluminescence from organic reactions. Formation of diphenoyl peroxide as an intermediate
[AD-A159144] N86-15341

POTENTIAL ENERGY
A summary of research on mesoscale energetics of severe storm environments N86-15807

POTENTIAL FLOW
Numerical solutions for three-dimensional cases: Delta wings N86-15264

POTENTIAL THEORY
A consistent spatial differencing scheme for the transonic full-potential equation in three dimensions
[NASA-TM-86716] N86-15246
Three families of integrable one-particle potentials
[PREPRINT-440] N86-16007

POTENTIOMETRIC ANALYSIS
Electrochemical gas sensors and gas analysis equipment
[DRIC-T-7521] N86-15354

POWDER (PARTICLES)
Standard X-ray diffraction powder patterns
[NBS/MN-25-SEC-21] N86-15357

POWDER METALLURGY
Application of fracture mechanics principles to fatigue crack growth in a powder metallurgy Ni-base superalloy N86-15372
Fluidized reduction of oxides on fine metal powders without sintering
[NASA-TM-77928] N86-15379
Effects of chemistry and processing on the fracture related properties of P/M alloy CT91
[AD-A159299] N86-15383
Hot isostatic pressing of ceramics
[NASA-TM-77931] N86-15397
POWER EFFICIENCY
Advanced Integrated Power and Attitude Control System (IPACS) study
[NASA-CR-3912] N86-15338
Micro-power dissipation device described N86-15441
Self-modulation instability of gyrotron emission N86-15501
POWER GAIN
Absolute measurements of antenna parameters by illumination method N86-15511
POWER SERIES
Analysis of drops in accuracy of least-squares approximation N86-15428
POWER SPECTRA
A new approach to signal registration with the emphasis on variable time delay estimation N86-15514
Techniques for fatigue life predictions from measured strains. Appendix E: HPOTP bearing cartridge and MCC coolant inlet duct power spectral densities
[NASA-CR-178515] N86-15689
POWER SUPPLY CIRCUITS
Fuji, Thomson to develop, produce high-powered transistors N86-15437
Thin-film bolometer power transduce electrodynamic analysis and experimental investigation N86-15609
Investigation of reverse branch of voltage-current curve of GaAs high-voltage p-n structure N86-15614
External locking of IMPATT-diode power oscillators N86-15618
POWER TRANSMISSION (LASERS)
Solar-pumped solid state Nd lasers
[NASA-TM-87615] N86-15658
PRECESSION
Precessions of the Earth and the Bohr atom
[DE85-015612] N86-16171
PRECIPITATION (METEOROLOGY)
Estimation of precipitation from GOES IR imagery during FGGE: Application to diagnostic studies N86-15775
Response of the mesoscale atmosphere to diabatic heating N86-15794
Severe storm detection with passive 37 Ghz observations N86-15797
Satellite passive microwave rain measurement techniques for land and ocean N86-15799
Cooperative VAS program with NASA Marshall Space Flight Center N86-15804
Preliminary planning for the Satellite Precipitaion And Cloud Experiment (SPACE) field program N86-15814
Interactive information processing for NASA's mesoscale analysis and space sensor program N86-15817
First Meeting of the Working Group on the Shuttle Microwave Precipitation Radiometer (SMPR) N86-15820
PREDICTION ANALYSIS TECHNIQUES
A conservation law related to Kelvin's circulation theorem
[AD-A157819] N86-15631
The Dowling wall pressure-spectrum analogy applied to an isotropic two-layered elastic medium
[AD-A158009] N86-15632
Wave motion analysis of a nonspinning liquid filled cylinder
[AD-A159324] N86-15636
Wave and surf forecast model evaluation for use on a micro computer
[AD-A159063] N86-15848
Outer product calculations
[AD-A158295] N86-15991
A theoretical investigation of acoustic cavitation
[AD-A158058] N86-16042
Optimum frequency for propagation of sound in shallow sound channels
[AD-A159064] N86-16047
Submicron phonics 1
[AD-A159421] N86-16131
PREDICTIONS
Aircraft Drag Prediction and Reduction
[AGARD-R-723] N86-15266
Parasitic and interference drag prediction and reduction N86-15272
Prediction of the drag of wings at subsonic speeds by viscous/inviscid interaction techniques N86-15274
Prediction of wing aeroelastic effects on aircraft lift and pitching moment characteristics
[NASA-TM-87631] N86-15319
Space activities of the United States, Soviet Union and other launching countries/organizations, 1957-1984
[GPO-46-504] N86-15330
Predicting and diagnosing performance of transistors, integrated circuits and large-scale-integration systems by multilevel simulation methods and programs N86-15487
Techniques for fatigue life predictions from measured strains
[NASA-CR-178574] N86-15688
Ceramic automotive Stirling engine study
[NASA-CR-174907] N86-16165
PREGNANCY
Can aircraft noise less than or equal 115 to dBA adversely affect reproductive outcome in USAF women?
[AD-A158322] N86-16045
PRESSURE DISTRIBUTION
Relative advantages of thin-layer Navier-Stokes and interactive boundary-layer procedures
[NASA-TM-86778] N86-15244
Numerical solutions of two-dimensional reference test cases N86-15262
PRESSURE DRAG
Hydrodynamic noise and surface compliance--an overview of the Naval Underwater Systems Center IR/IED program
[AD-A157799] N86-15630
PRESSURE GAGES
Proving ring calibrations using a deadweight pressure system
[RFP-3677] N86-15650
PRESSURE GRADIENTS
Airborne Doppler measurements of the central California extended sea breeze N86-15791
Mesoscale ageostrophic circulations associated with baroclinic jet streaks N86-15795
PRESSURE ICE
Arctic Ocean background noise caused by ridging of sea ice
[AD-A159587] N86-16050
PRESSURE SENSORS
Time-resolved flowfield measurements in a turbine stage
[AD-A158092] N86-15634
PRESSURE VESSELS
PBFA-2 vacuum system design using a lumped parameter computer model
[DE85-013117] N86-16125
PRESSURIZED CABINS
Functional state of the olfactory analyzer in a pressurized environment N86-15890
PREVENTION
A buffer diverter system
[AD-D011902] N86-15559
PRINTED CIRCUITS
Laser technology in manufacture of printed-circuit boards N86-15469
Red-graphic editor in printed circuit board design system N86-15942
PROBABILITY DENSITY FUNCTIONS
A general model for the homogeneous case of the continuous response
[AD-A159345] N86-15914
A lower confidence bound on the probability of a correct selection
[AD-A159164] N86-16023
The experimental investigation of the inverse problem in rough surface scattering of acoustic waves
[AD-A158070] N86-16044
PROBABILITY THEORY
Probabilistic analysis of steel containment strength with internal pressure
[DE85-015520] N86-15389
Detection of periodic signal of arbitrary shape with random time delay
[AD-A158979] N86-15524
Programs to compute the Circular Error Probability (CEP) of a location system with direction finding stations
[FEL-1985-20] N86-15538
Lower limit of error probability in discrete addition of binary signals from parallel channels N86-15586
Determining probabilities of geologic events and processes
[TI85-014642] N86-15762
A general model for the homogeneous case of the continuous response
[AD-A159345] N86-15914
A lower confidence bound on the probability of a correct selection
[AD-A159164] N86-16023
Tests for a change-point
[AD-A159381] N86-16025
A delayed random choice quantum mechanics experiment using light quanta N86-16143
Probabilistic analysis of a network resource allocation algorithm. Revision
[AD-A158970] N86-16150
PROBLEM SOLVING
A computer model of case-based reasoning in problem solving: An investigation in the domain of dispute mediation
[AD-A158097] N86-15912
Modeling problem-oriented multiprocessor systems N86-15932
Problem solving under time-constraints
[AD-A158921] N86-15957
An exact algorithm for the knapsack problem
[INPE-3645-PRE/815] N86-15984
Constructing a perfect matching is in Random NC
[AD-A157813] N86-15988
The equal flow problem
[AD-A159594] N86-16028
PRODUCT DEVELOPMENT
FRG turns efforts to laser development N86-15436
Fuji, Thomson to develop, produce high-powered transistors N86-15437
Call to expand information network for basic research N86-15475
PRODUCTION PLANNING
Functional-logical system for automated planning of robot production line control systems N86-15940
PRODUCTIVITY
Field test of the methodology for generating efficiency and effectiveness measures
[AD-A158183] N86-16149
PROFILOMETERS
Effect of conductor profile on force characteristics due to motion of a magnetic field source N86-15607
PROGRAM VERIFICATION (COMPUTERS)
Ada (trade name) compiler validation summary report: Rational environment, version A.2.0.6 for rational R1000
[AD-A157830] N86-15949
Practical guidelines for testing Ada programs
[AD-A158099] N86-15951
PROGRAMMING LANGUAGES
East Europe report: Science and technology
[JPRS-ESA-85-033] N86-15473
Robotron hardware compatible programming languages surveyed N86-15474
Cybernetics Institute develops parallel-processing computer N86-15936
Ada (trade name) compiler validation summary report: Rational environment, version A.2.0.6 for rational R1000
[AD-A157830] N86-15949
The LOGLISP programming system
[AD-A158011] N86-15950
Implementation of a serial delay insertion type loop communication for a real time multitransputer system
[AD-A158980] N86-15960
Relational programming: Design and implementation of a prototype interpreter
[AD-A159404] N86-15962
The revised report on Scheme or an uncommon Lisp
[AD-A159423] N86-15963
The design and analysis of a stylized natural grammar for an object-oriented language (OMEGA)
[AD-A159434] N86-15964
Running ROSS in an Emacs environment
[AD-A159567] N86-15966
PROGRESS
Topics in theoretical physics
[DE85-016734] N86-16074
PROJECT MANAGEMENT
Assurance Program for Remedial Action (APRA) microcomputer-operated bibliography management system
[DE85-008763] N86-16155
National Science Foundation authorization, 1986
[GPO-46-945] N86-16162
PROJECTILES
Wave motion analysis of a nonspinning liquid filled cylinder
[AD-A159324] N86-15636
Color post-processor for the EPIC-2 computer program
[AD-A159321] N86-15961
PROJECTIVE GEOMETRY
Visual display parameters
[AD-A158773] N86-15654
PROP-FAN TECHNOLOGY
West Europe report: Science and technology
[JPRS-WST-85-024] N86-15447
French program CHARME develops propfan aircraft N86-15450
PROPELLANT DECOMPOSITION
Critical analysis of nitramine decomposition data: Product distributions from HMX and RDX decomposition
[AD-A159325] N86-15368

PROPELLANT GRAINS
Simultaneous incremental strain/incremental temperature analog device for, and method, of testing for stress response
[AD-D011912] N86-15411
Acoustical imaging system evaluation
[AD-A159425] N86-15684
PROPELLER SLIPSTREAMS
Studies on the interference of wings and propeller slipstreams N86-15241
PROPULSION SYSTEM PERFORMANCE
Small turbine technology review
[AD-A158514] N86-15316
PROTECTION
Topical hazard evaluation program of Candidate Insect repellent AI3-35770 Hexahydro-1-((2-Methylcyclohexyl) Carbonyl)-1-H-Azepine
[AD-A158386] N86-15903
PROTON BEAMS
Experiments on cryogenic pulsed ion sources N86-16098
PROTONS
Time-resolved measurement of energy and species of an intense pulsed ion beam N86-16104
PROVING
On the matrix convexity of the Moore-Penrose inverse and some applications
[AD-A158992] N86-16019
A delayed random choice quantum mechanics experiment using light quanta N86-16143
PSEUDORANDOM SEQUENCES
Procedures and general method for checking microprocessor malfunctions on the basis of pseudorandom testing sequences N86-15929
PSYCHOLOGICAL FACTORS
Problems of studying flight work in Soviet aviation medicine of the 1920's - 1930's N86-15866
Human factors engineering design criteria for future systems. Report number 3: Design criteria evolving from the Multiple Multiple Rocket System (MLRS) operational test 3
[AD-A158316] N86-15916
PSYCHOMOTOR PERFORMANCE
Effect of threat stress on psychomotor stability of pilots differing in anxiety level N86-15869
Use of flight simulators for demonstration of functional capacities of flight personnel N86-15870
Experience and performance in video games and its influence on aptitude tests in aviation psychology
[DFVLR-FB-85-43] N86-15915
PSYCHOPHYSICS
Prosodic analysis by rule
[BR94770] N86-15516
PSYCHOPHYSIOLOGY
Enhancing visual sensitivity
[AD-A158799] N86-15906
PULSE AMPLITUDE
High-power pulse generator with pulseform control for powering gas-discharge tubes of laser pumping systems N86-15499
PULSE COMMUNICATION
Efficiency of storing pulse products in coherent signal packets N86-15584
PULSE DURATION
High-power sources with smoothly adjustable pulse duration for powering gas-discharge tubes of laser pumping systems N86-15498
Optical characteristics of lightning N86-15789
Stimulated Raman scattering in the atmosphere and its implication for FELs
[DE85-016066] N86-16093
PULSE DURATION MODULATION
Pulse-type voltage stabilizer with integral pulse-width modulation N86-15505
PULSE GENERATORS
Novel control circuit for proximity focused microchannel plate image intensifiers N86-15481
High-power pulse generator with pulseform control for powering gas-discharge tubes of laser pumping systems N86-15499
PULSE RADAR
Multiscale modeling to evaluate proposed space-based Doppler lidar sampling strategies N86-15774
Analysis of Doppler lidar data N86-15792
PULSED LASERS
Use of optical fibers in pulsed holography
[ISL-CO-231/84] N86-15657
Plasmas as light sources for lasers
[AD-A159460] N86-15666
Interface alignment system
[AD-D011896] N86-16087
Laser produced plasma affects on welding
[DE85-009638] N86-16118
PULSED RADIATION
Crystal analyser mirror type down-scattering spectrometer using spallation neutron source N86-15425
Measuring radiation electroconductivity of solid dielectrics exposed to pulsed ionizing radiation N86-15604
Optical characteristics of lightning N86-15789
Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams
[IPPJ-742] N86-16096
Characteristics of intense pulsed ion beam extracted from dual-current-feed magnetically-insulated diode N86-16103
PULSES
Electron reactions in model and biological systems
[DE85-016062] N86-15861
Localization of buried objects in water-saturated sand by variable incidence acoustic pulse reflections
[AD-A158064] N86-16043
Subnanosecond short wavelength generation using optical fibers
[AD-A158769] N86-16090
PYRANOMETERS
Studies of humid continental haze during SPACE N86-15813

Q

QUALITATIVE ANALYSIS
Variability of major organic components in aircraft fuels
[AD-A159057] N86-15415
QUALITY CONTROL
LANDSAT TM image data quality analysis for energy-related applications
[E86-10009] N86-15703
QUANTUM CHEMISTRY
United States Air Force Academy, Department of Chemistry Research: AY 1983-1984
[AD-A159319] N86-15343
QUANTUM ELECTRONICS
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-011] N86-15484
Investigation of quantum effects in heterostructures
[AD-A158327] N86-15550
QUANTUM MECHANICS
A delayed random choice quantum mechanics experiment using light quanta N86-16143
QUANTUM STATISTICS
GGLP effect from 1959 to 1984
[DE85-011981] N86-16069
QUANTUM THEORY
Self-consistent approximation for squeezing generation in a nonlinear optical medium
[NOTA-INTERNA-845] N86-16094
Stochastic theory of emission and absorption of quanta
[NOTA-INTERNA-847] N86-16147
QUARTZ
Subnanosecond short wavelength generation using optical fibers
[AD-A158769] N86-16090
QUARTZ TRANSDUCERS
Nonsinusoidal modes of oscillator with multifrequency surface-acoustic-wave resonator N86-15488
QUASI-STEADY STATES
Strip and microstrip line periodic heterogeneities N86-15908
QUENCHING (ATOMIC PHYSICS)
Measuring the orbit length of the Tevatron
[DE85-017443] N86-16079
QUENCHING (COOLING)
Self-quenching streamer discharge characteristics at extreme gas compositions N86-15442
QUEUEING THEORY
Queueing network systems with unbalanced flows and their applications to performance evaluation of highly parallel distributed information systems: Revision
[AD-A158052] N86-16154

R

RADAR
Number of targets threatened simultaneously (NOTTS) in conjunction with over the horizon back-scatter (OTHB) radar coverage
[AD-A159304] N86-15528
A preliminary report on some recent results in born inversion
[AD-A158926] N86-15958
RADAR ANTENNAS
Boundary waves in finite antenna arrays N86-15455
Basic characteristics of radar antenna with synthesized aperture tracking arbitrary motion of aircraft N86-15575
RADAR DATA
SAR (Synthetic Aperture Radar) data collection and processing summary - 1984 SARSEX (SAR internal wave signature experiment) experiment
[AD-A159440] N86-15530
RADAR DETECTION
Efficiency of storing pulse products in coherent signal packets N86-15584
RADAR ECHOES
Analysis of Doppler lidar data N86-15792
Satellite passive microwave rain measurement techniques for land and ocean N86-15799
RADAR IMAGERY
Characteristics of radar objects detectable by superwide-band signals N86-15576
RADAR RESOLUTION
Basic characteristics of radar antenna with synthesized aperture tracking arbitrary motion of aircraft N86-15575
RADAR SCANNING
Analysis of Doppler lidar data N86-15792
Satellite passive microwave rain measurement techniques for land and ocean N86-15799
RADAR SCATTERING
Time characteristics of scattering by radar targets N86-15512
Investigations of the interference scattering and methods for its suppression in near-ground radar backscattering measurements
[DFVLR-FB-85-42] N86-15539
RADAR SIGNATURES
Satellite passive microwave rain measurement techniques for land and ocean N86-15799
Satellite microwave observations of a storm complex: A comparative analysis
[NASA-CR-176430] N86-15822
RADAR TARGETS
Time characteristics of scattering by radar targets N86-15512
RADAR TRACKING
Basic characteristics of radar antenna with synthesized aperture tracking arbitrary motion of aircraft N86-15575
Preliminary planning for the Satellite Precipitaion And Cloud Experiment (SPACE) field program N86-15814
RADIAL FLOW
On second propagation in radial fan casings
[DFVLR-FB-85-32] N86-16053
RADIANCE
Remote sensing of coastal wetlands biomass using Thematic Mapper wavebands N86-15709
Statistical analysis and use of VAS radiance data N86-15811
RADIANT FLUX DENSITY
Absolute measurements of antenna parameters by illumination method N86-15511
Measurement of radiation intensity on the IEA SSPS/CRS solar tower plant in Spain
[DFVLR-FB-85-36] N86-15739
RADIATION ABSORPTION
Vitamin-E 174N,38G general purpose cross-section library
[DE85-013110] N86-16161
RADIATION BELTS
The charge-state composition of 0.4-MeV helium ions in Earth's outer radiation belts during quiet times
[AD-A147561] N86-15757
RADIATION DAMAGE
Time dependent rate theory for diffusional defect processes
[ORNL-6122] N86-15355
On the effects of X irradiation on the Bacillus subtilis spores in a day and wet system
[DFVLR-FB-85-44] N86-15864
RADIATION DETECTORS
Radiation mapping on Spacelab 1: Experiment no. INS006
[NASA-CR-171893] N86-15332
RADIATION DOSAGE
The effect of environmental stress on Sylgard 170 silicone elastomer
[TI85-013268] N86-15407
Advances in radiobiological research: Hypoxic irradiation effects N86-15894
Workshop on Radiobiological Effectiveness of Neutrons
[DE85-017577] N86-16084
RADIATION EFFECTS
The effect of environmental stress on Sylgard 170 silicone elastomer
[TI85-013268] N86-15407
New type of impurity defects in semiinsulating gallium arsenide N86-15595
Radiation effects in actinide host phases
[DE85-016273] N86-16075

Comparison of 2D memory SEU transport simulations with experiments
[DE85-016134] N86-16137

RADIATION MEASUREMENT
Radiation mapping on Spacelab 1: Experiment no. INS006
[NASA-CR-171893] N86-15332
Recommendations for developing simulators of solar radiation penetrating to the Earth's surface N86-15603
Measuring radiation electroconductivity of solid dielectrics exposed to pulsed ionizing radiation N86-15604

RADIATION PRESSURE
Radiation pressure and the geocorona N86-15749

RADIATION SHIELDING
Material shields against neutral atomic particle beams
[AD-A159445] N86-16058

RADIATION SPECTRA
Development of radiative cooling materials, phase 3
[DE85-014666] N86-15404
Systematic and random variations in digital Thematic Mapper data
[E66-10018] N86-15711
Droplet size and evaporation rate within a two-phase flow by morphology-dependent resonances in the optical spectra
[AD-A158931] N86-16091

RADIATION TOLERANCE
On the effects of X irradiation on the Bacillus subtilis spores in a day and wet system
[DFVLR-FB-85-44] N86-15864

RADIATION TRANSPORT
Radionuclide Migration Project 1984
[DE85-017383] N86-16076
Vitamin-E 174N,38G general purpose cross-section library
[DE85-013110] N86-16161

RADIATIVE TRANSFER
Remote reconnaissance of submerged aquatic vegetation: A radiative transfer approach N86-15708

RADIO COMMUNICATION
A brief investigation of adaptive decision feedback equalization for digital HF links employing PSK (Phase Shift Keying) modulation
[AD-A157809] N86-15545

RADIO DIRECTION FINDERS
Programs to compute the Circular Error Probability (CEP) of a location system with direction finding stations
[FEL-1985-20] N86-15538

RADIO FREQUENCIES
Ultrasonic transit time measurements using fast analog to digital conversion and a fast fourier transform based algorithm
[AD-A159426] N86-16049

RADIO FREQUENCY INTERFERENCE
Signal and interference levels in antenna array with optimum radiation pattern N86-15461
Optimum frequency of communication channel for indoor radio telemetry N86-15493

RADIO TELEMETRY
Optimum frequency of communication channel for indoor radio telemetry N86-15493

RADIO TRANSMISSION
Single station assessment of atmospheric boundary layer properties in the eastern Mediterranean Sea
[AD-A159432] N86-15827

RADIO WAVES
Local ionospheric irregularity effect on ELF radiowave propagation N86-15569

RADIOACTIVE DECAY
Search for the XI(2220) at Lear
[DE85-014329] N86-16070

RADIOACTIVE WASTES
A review of biological processes within oceanic water columns relevant to the assessment of the safety of disposal of waste, notably radioactive isotopes, on or within the seabed
[IOS-198] N86-15745
Determining probabilities of geologic events and processes
[TI85-014642] N86-15762
The permeability and consolidation of deep sea sediments
[IOS-201] N86-15855
Radiation effects in actinide host phases
[DE85-016273] N86-16075

RADIOBIOLOGY
Optimum frequency of communication channel for indoor radio telemetry N86-15493
East Europe report: Science and technology
[JPRS-ESA-85-031] N86-15893
Advances in radiobiological research: Hypoxic irradiation effects N86-15894
Advances in optoelectronic, nuclear reactor, radiobiological research: High voltage optocoupler N86-15896
Workshop on Radiobiological Effectiveness of Neutrons
[DE85-017577] N86-16084

RADIOGRAPHY
Flash X-ray with image enhancement applied to combustion events
[AD-A159328] N86-15369

RADIOISOTOPE BATTERIES
Assessment of dynamic energy conversion systems for radioisotope heat sources
[DE85-016202] N86-15737

RADIOMETERS
Apparatus for experimental study of high-resolution radiometers and their characteristics N86-15496
Measurement of radiation intensity on the IEA SSPS/CRS solar tower plant in Spain
[DFVLR-FB-85-36] N86-15739
Studies of humid continental haze during SPACE N86-15813

RADIOMETRIC RESOLUTION
Evaluation of spatial, radiometric and spectral Thematic Mapper performance for coastal studies
[E86-10016] N86-15706
Remote reconnaissance of submerged aquatic vegetation: A radiative transfer approach N86-15708

RAIN
Large-scale circulation anomalies and the predictability of northeast Brazil droughts
[INPE-3656-PRE/819] N86-15768
Optical characteristics of lightning and thunderstorm currents N86-15788
Remote sensing of severe convective storms N86-15800

RAINSTORMS
Severe storm detection with passive 37 Ghz observations N86-15797

RAMAN SPECTRA
Micro-Raman spectroscopy: The analysis of micrometer and submicrometer atmospheric aerosols
[NASA-CR-177964] N86-15756
Subnanosecond short wavelength generation using optical fibers
[AD-A158769] N86-16090
Stimulated Raman scattering in the atmosphere and its implication for FELs
[DE85-016066] N86-16093

RAMP FUNCTIONS
Bipolar digitizer having compression capability
[AD-D011895] N86-15542

RANDOM NOISE
A new approach to signal registration with the emphasis on variable time delay estimation N86-15514
Detection of periodic signal of arbitrary shape with random time delay
[AD-A158979] N86-15524

RANDOM VARIABLES
Systematic and random variations in digital Thematic Mapper data
[E86-10018] N86-15711
Strong representation of weak convergence
[AD-A159078] N86-16000
Extreme value theory and dependence
[AD-A159138] N86-16001
On the angle for stationary random fields
[AD-A158982] N86-16018
Tests for a change-point
[AD-A159381] N86-16025
A computer program for analyzing loglinear models with latent variables: LCAG N86-16026

RANKINE CYCLE
Assessment of dynamic energy conversion systems for radioisotope heat sources
[DE85-016202] N86-15737

RANKING
Constructing a perfect matching is in Random NC
[AD-A157813] N86-15988
Multiple decision procedures for Tukey's generalized lambda distributions
[AD-A159153] N86-16021
On the least favorable configuration of a selection procedure based on ranks
[AD-A159154] N86-16022

RARE EARTH ALLOYS
Electronic structure of rare Earth metals and intermetallics
[DE85-015523] N86-16139

RARE GAS-HALIDE LASERS
Delay effect in pulsed avalanche discharge of an XeCl laser at high gas pressure N86-15482

RARE GASES
PETROS: A progam for calculating transport of heat, water, water vapor and air through a porous material
[DE85-013168] N86-15972

RATES (PER TIME)
Variable radix processor
[AD-D011893] N86-15918

RATIOS
Self-consistent electronic structure of alpha-phase Hume-Rothery electron compound
[DE85-017560] N86-16080

RATS
Potency of photoflash-produced retrograde amnesia in rats
[AD-A159149] N86-15859
Intensity of lipid peroxidation in hypokinetic rat tissues N86-15876
Effect of 24,25-dihydroxyvitamin D3 on osteogenetic precursor cells in immobilized rats N86-15877
Basic results of experiments with long-term rotation of rats as applied to the problem of artificial gravity N86-15878
Investigation of possibility of using two-frequency impedometry for estimation of proportion of total and extracellular body fluids N86-15888
Advances in radiobiological research: Hypoxic irradiation effects N86-15894
Tritium ingestion in rats N86-15895

RAWINSONDES
Mobile intercept of storms N86-15771
Airborne Doppler measurements of the central California extended sea breeze N86-15791

RAYLEIGH SCATTERING
Configurational diffusion in semidilute solutions
[DE85-017121] N86-15405
Theoretical studies in nondestructive evaluation (NDE)
[AD-A159155] N86-15682

RDX
Critical analysis of nitramine decomposition data: Product distributions from HMX and RDX decomposition
[AD-A159325] N86-15368
Microstructural origins of hot spots in RDX explosive and several reference inert materials
[AD-A158223] N86-15413

REACTION KINETICS
Dynamics of recrystallization and redistribution of impurities in semiconductors exposed to millisecond laser radiation N86-15597
Application of electron-transfer theory to several systems of biological interest
[DE85-015835] N86-15860
Friction in nuclear dynamics
[DE85-011984] N86-16066
In search of high J states in the HF(v, J) system
[AD-A158937] N86-16073
Alpha-burning in ICF target N86-16109

REACTION TIME
The airlift dilemma: An update
[AD-A159307] N86-15353

REACTION WHEELS
Advanced Integrated Power and Attitude Control System (IPACS) study
[NASA-CR-3912] N86-15338

REACTIVITY
Microstructures built from electroactive polymers: Toward a macromolecular electronics
[AD-A159430] N86-15400

REACTOR DESIGN
Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams
[IPPJ-742] N86-16096
Large aspect ratio, high-beta tokamak fusion reactor
[DE85-016654] N86-16122

REACTOR MATERIALS
Time dependent rate theory for diffusional defect processes
[ORNL-6122] N86-15355
Research for thermal behavior of liquid-metal wall in ICF reactor N86-16111

REACTOR PHYSICS
Research for thermal behavior of liquid-metal wall in ICF reactor N86-16111

REAL TIME OPERATION
Real-time digital terrain image generator
[AD-A159316] N86-15327
Studies of lightning data in conjunction with geostationary satellite data N86-15785
Automated mesoscale winds derived from GOES multispectral imagery N86-15798

REAL VARIABLES
Basic research in reliability for real systems
[AD-A159100] N86-15681

RECEIVERS
Naval space surveillance modernized receiver system. Volume 6: Data communications subsystem
[AD-A158465] N86-15523
Effect of antenna impedance mismatch on the signal-to-noise ratio of a radio receiving system
[AD-A159070] N86-15525
Lower limit of error probability in discrete addition of binary signals from parallel channels N86-15586

Analysis and identification of inertial devices N86-15594
A preliminary report on some recent results in born inversion
[AD-A158926] N86-15958

RECOGNITION
A model of an expert computer vision and recognition facility with applications of a proportion technique
[AD-A158073] N86-15922

RECOMBINATION COEFFICIENT
Predicting and diagnosing performance of transistors, integrated circuits and large-scale-integration systems by multilevel simulation methods and programs N86-15487

RECOMBINATION REACTIONS
Novel transport and recombination processes in semiconductors
[AD-A158321] N86-15549

RECONSTRUCTION
An optimisation method for reconstruction of flight path trajectories from non-synchronous time-sampled observations by two cine cameras
[ARL-SYS-R-34] N86-15279

RECRYSTALLIZATION
New type of impurity defects in semiinsulating gallium aresenide N86-15595
Dynamics of recrystallization and redistribution of impurities in semiconductors exposed to millisecond laser radiation N86-15597

RECURSIVE FUNCTIONS
Three families of integrable one-particle potentials
[PREPRINT-440] N86-16007
Tests for a change-point
[AD-A159381] N86-16025

REDUNDANCY
Raising the reliability of a remote processing system N86-15928

REFLECTANCE
Optimum frequency of communication channel for indoor radio telemetry N86-15493
Remote reconnaissance of submerged aquatic vegetation: A radiative transfer approach N86-15708

REFLECTED WAVES
Optimum frequency of communication channel for indoor radio telemetry N86-15493

REFRACTIVITY
Athermal conditions of optical elements and properties of optical materials N86-15423
Properties of optical filters on CdSe-HgSe base N86-15506
Solution to reverse refraction problem N86-15562

REFRACTORY MATERIALS
Integrating sphere spectrometer for high-temperature materials characterization
[DE85-012170] N86-15656

REGENERATION (ENGINEERING)
Novel sorbents for high temperature regenerative H2S removal
[NASA-CR-176449] N86-15360

REGRESSION ANALYSIS
Optimal design application on the advanced aeroelastic rotor blade N86-15290
The relationship between material failures and flight hours: Statistical considerations
[AD-A159571] N86-15311

REGULATIONS
Proposals for acid-rain control from the 98th Congress
[DE85-015268] N86-15744

REINFORCING FIBERS
Thermal-mechanical fatigue test apparatus for metal matrix composites and joint attachments
[NASA-TM-87187] N86-15378

RELATIVISTIC EFFECTS
Short-lived solar burst spectral component at approximately 100 GHz
[INPE-3550-PRE/762] N86-16178

RELATIVISTIC ELECTRON BEAMS
Rate of widening of strong-field domain in supercritically doped Gunn-effect devices N86-15589
Stimulated emission of bounded strong-current electron beam with longitudinal magnetic field magnetostatic pumping N86-15591
Tubular strong-current relativistic electron beam instability N86-15592
Investigations of laser initiated discharge channels
[AD-A158872] N86-15660
Angular-gain spectrum of free electron lasers
[AD-A159412] N86-15665
Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams
[IPPJ-742] N86-16096
Geometric compression of hollow cylinder in a coaxial relativistic electron beam diode N86-16101

RELATIVISTIC THEORY
Black holes, pregalactic stars and the dark matter problem
[DE85-015385] N86-16168

RELATIVISTIC VELOCITY
Short-lived solar burst spectral component at approximately 100 GHz
[INPE-3550-PRE/762] N86-16178

RELAXATION TIME
Configurational diffusion in semidilute solutions
[DE85-017121] N86-15405

RELIABILITY
Light helicopter family trade-off analysis. Volume 8: Appendices S and T
[AD-A158077] N86-15308
Procedure for calculating attenuation in and reliability of atmospheric optical data transmission systems N86-15470
Basic research in reliability for real systems
[AD-A159100] N86-15681
Multiprocessor systems with dynamic redistribution of requests through a common bus N86-15933
High-speed receivers of microprocessor signal conversion devices N86-15938
Automated flaw detection information-measuring system N86-15941
Mean residual life: Theory and applications
[AD-A158589] N86-16013

REMOTE CONTROL
CNES of France researches remote control system for space N86-15444

REMOTE SENSING
Biochemical processes in sagebrush ecosystems: Interactions with terrain
[E86-10015] N86-15705
Evaluation of spatial, radiometric and spectral Thematic Mapper performance for coastal studies
[E86-10016] N86-15706
Remote reconnaissance of submerged aquatic vegetation: A radiative transfer approach N86-15708
Microwave radiometers for remote sensing applications
[REPT-S-157] N86-15716
Image registration N86-15718
NASA/MSFC FY-85 Atmospheric Processes Research Review
[NASA-CP-2402] N86-15769
Remote sensing of severe convective storms N86-15800
Time composite sounding N86-15808
Interactive information processing for NASA's mesoscale analysis and space sensor program N86-15817
Isolated data acquisition system for high voltage applications
[DE85-016984] N86-16116

REMOVAL
Development of packed-tower air strippers for trichloroethylene removal at Wurtsmith Air Force Base, Michigan
[AD-A159139] N86-15326

REPLENISHMENT
BASD: SIRTF Telescope Instrument Changeout and Cryogen Replenishment (STICCR) study
[NASA-CR-177381] N86-15334

REPORTS
Topics in theoretical physics
[DE85-016734] N86-16074

REPRODUCTION (BIOLOGY)
Can aircraft noise less than or equal 115 to dBA adversely affect reproductive outcome in USAF women?
[AD-A158322] N86-16045

REPRODUCTION (COPYING)
Mathematical theory of holographic memory N86-15946

RESEARCH
Topics in theoretical physics
[DE85-016734] N86-16074
Antarctic Meteorite Newsletter, Volume 8, Number 2
[NASA-CR-176401] N86-16167

RESEARCH AND DEVELOPMENT
Congressional Workshop on Advanced Materials Research and Development
[GPO-47-717] N86-15340

RESEARCH FACILITIES
Programming a multiple-orifice hydraulic decelerator
[AD-A159428] N86-15328
Congressional Workshop on Advanced Materials Research and Development
[GPO-47-717] N86-15340
Launchers, satellites, multinational plans in 1985 CHES budget N86-15448
Searching the horizon: A history of Ames Research Center, 1940-1976
[NASA-SP-4304] N86-16185

RESEARCH MANAGEMENT
Activities report in aerospace research N86-15240
Research in applied mathematics related to nonlinear system theory
[AD-A158330] N86-16027
Brief introduction to the Soviet Central Research Institute of Aerodynamics
[AD-A159103] N86-16148

RESIDUAL STRESS
X-ray elastic constants and their meaning for Al and Fe
[AD-A158251] N86-15382
Profile fitting in residual stress determination
[AD-A158881] N86-15691
Ultrasonic transit time measurements using fast analog to digital conversion and a fast fourier transform based algorithm
[AD-A159426] N86-16049

RESIDUES
Residues of integrals with three-dimensional multipole singularities, with application to the Lagally theorem
[AD-A158771] N86-15995

RESIN MATRIX COMPOSITES
Investigation of the friction of Becorit 820 versus cast iron
[WB-83/TRI-10053] N86-15675

RESOLUTION
Characteristics of radar objects detectable by superwide-band signals N86-15576

RESONANCE
Influence of various unsteady aerodynamic models on the aeromechanical stability of a helicopter in ground resonance N86-15294
A theoretical investigation of acoustic cavitation
[AD-A158058] N86-16042

RESONANCE FLUORESCENCE
Droplet size and evaporation rate within a two-phase flow by morphology-dependent resonances in the optical spectra
[AD-A158931] N86-16091

RESONANCE PROBES
Ferromagnetic resonance probe liftoff suppression apparatus
[AD-D011913] N86-15647

RESONANT FREQUENCIES
The flapping movement and frequency of rotating windmill wings defined with a differential equation
[IW-R501] N86-15255
Experimentally determined flutter from two- and three-bladed model bearingless rotors in hover N86-15286
Influence of higher types of oscillations on piston-tuned waveguide Gunn oscillator frequency N86-15611

RESONANT VIBRATION
Optimal design application on the advanced aeroelastic rotor blade N86-15290

RESONATORS
Multilayer volume microwave filters N86-15465
Nonsinusoidal modes of oscillator with multifrequency surface-acoustic-wave resonator N86-15488
Modal analysis of unstable resonators
[AD-A159225] N86-15663
Superconducting resonators for the University of Washington booster linac
[DE85-017419] N86-16124

RESOURCE ALLOCATION
Probabilistic analysis of a network resource allocation algorithm. Revision
[AD-A158970] N86-16150

RESPONSE TIME (COMPUTERS)
On the number of bootstrap simulations required to construct a confidence interval
[AD-A158880] N86-16016

RESTORATION
Pseudoinverse restoration of blurred image in uniform motion N86-15483

RETINA
Computational models of human vision with applications
[NASA-CR-176413] N86-15898

REVENUE
National Aeronautics and Space Administration authorization for fiscal year 1986
[S-HRG-99-102] N86-16163

REVERBERATION
Analytical study of acoustic response of a semireverberant enclosure with application to active noise control
[NASA-TP-2472] N86-16040

REYNOLDS NUMBER
Hypersonic characteristics of an advanced aerospace plane at Mach 20.3
[NASA-TM-86435] N86-15245
F-111 natural laminar flow glove flight test data analysis and boundary layer stability analysis
[NASA-CR-166051] N86-15305

RHENIUM
Solar rocket absorber
[AD-D011897] N86-15336
RHEOENCEPHALOGRAPHY
Oxygenation and regional circulation in gingival mucosal tissues under effect of head-to-pelvis (+Gz) accelerations N86-15872
RHEOLOGY
Automatic determination of cardiac output from rheogram of the trunk N86-15889
RIGID ROTORS
Coupled rotor-body vibrations with inplane degrees of freedom N86-15301
RIGID STRUCTURES
Pressure ring calibrations using a deadweight pressure system
[RFP-3677] N86-15650
RISK
Workshop on Radiobiological Effectiveness of Neutrons
[DE85-017577] N86-16084
ROBOTICS
Microelectronics technology N86-15930
Functional-logical system for automated planning of robot production line control systems N86-15940
USSR report: Cybernetics, computers and automation technology
[JPRS-UCC-85-009] N86-15943
Hypercube concurrent computation and virtual time for robotic application
[DE85-009479] N86-15979
ROBOTS
Electric drive motors for industrial robots N86-15600
Balancing of a rod using a digitally controlled robot
[DFVLR-FB-85-41] N86-15677
ROBUSTNESS (MATHEMATICS)
Control system design for cryogenic wind tunnel by performance vector performance
[DFVLR-FB-85-37] N86-15329
ROCKET ENGINE CASES
Acoustical imaging system evaluation
[AD-A159425] N86-15684
ROCKET ENGINES
Solar rocket absorber
[AD-D011897] N86-15336
Techniques for fatigue life predictions from measured strains
[NASA-CR-178574] N86-15688
ROCKET LAUNCHERS
Human factors engineering design criteria for future systems. Report number 3: Design criteria evolving from the Multiple Multiple Rocket System (MLRS) operational test 3
[AD-A158316] N86-15916
ROLL
A review of dynamic inflow and its effect on experimental correlations N86-15293
ROSSBY REGIMES
The effect of the Benthic Boundary Layer on the physics of intense mesoscale eddies N86-15751
ROTARY WING AIRCRAFT
Fundamental study of flow field generated by rotorcraft blades using wide-field shadowgraph
[NASA-CR-176443] N86-15249
Rotorcraft Dynamics 1984
[NASA-CP-2400] N86-15280
Ground resonance analysis using a substructure modeling approach N86-15282
Test results from a dynamic model dynaflex rotor N86-15285
Development of an unsteady aerodynamics model to improve correlation of computed blade stresses with test data N86-15288
ROTARY WINGS
Fundamental study of flow field generated by rotorcraft blades using wide-field shadowgraph
[NASA-CR-176443] N86-15249
The flapping movement and frequency of rotating windmill wings defined with a differential equation
[IW-R501] N86-15255
Lifting surface theory for a helicopter rotor in forward flight N86-15287
Optimal design application on the advanced aeroelastic rotor blade N86-15290
Restructuring the rotor analysis program C-60 N86-15292
An examination of the relations between rotor vibratory loads and airframe vibrations N86-15299
Analysis of potential helicopter vibration reduction concepts N86-15302
ROTATING ENVIRONMENTS
Basic results of experiments with long-term rotation of rats as applied to the problem of artificial gravity N86-15878
ROTATING FLUIDS
Instability of time-periodic flows
[NASA-CR-178009] N86-15629
ROTATING SPHERES
Residues of integrals with three-dimensional multipole singularities, with application to the Lagally theorem
[AD-A158771] N86-15995
ROTATING STALLS
Resonant cavities for stall recovery in gas turbine engines
[AD-D011891] N86-15317
ROTATION
Machine with an intermittently rotating table for the performance of work operations
[AD-D011911] N86-15669
Detection of rotating thunderstorms using satellite imagery N86-15810
Stimulated Raman scattering in the atmosphere and its implication for FELs
[DE85-016066] N86-16093
ROTOR AERODYNAMICS
Performance and loads data from a hover test of a full-scale XV-15 rotor
[NASA-TM-86833] N86-15243
Lifting surface theory for a helicopter rotor in forward flight N86-15287
ROTOR BLADES
The use of active controls to augment rotor/fuselage stability N86-15281
ROTOR BODY INTERACTIONS
The use of active controls to augment rotor/fuselage stability N86-15281
ROTOR SPEED
Parametric study of the aeroelastic stability of a bearingless rotor N86-15283
ROTOR SYSTEMS RESEARCH AIRCRAFT
Evaluation of a load cell model for dynamic calibration of the rotor systems research aircraft N86-15304
ROTORS
Aeroelastic considerations for torsionally soft rotors N86-15289
Advanced Integrated Power and Attitude Control System (IPACS) study
[NASA-CR-3912] N86-15338
Active magnetic suspension in main magnetic field of electric motor N86-15502
System engineering and energy cost analysis of small and medium wind turbines
[DE85-012159] N86-15738
ROUGHNESS
Influence of roughness of ends of fiber optic plates on modulation transfer coefficient N86-15508
ROUTES
Specific recommendations for improving network feedback to hosts
[AD-A158768] N86-15924
RUBBER
Simultaneous incremental strain/incremental temperature analog device for, and method, of testing for stress response
[AD-D011912] N86-15411
DFVLR develops new kind of walls or wind tunnel N86-15446
Static and dynamic material model for elastohydrodynamic bearing calculations
[IWECO-5076503] N86-15676
RUBIDIUM ISOTOPES
The parameters of adiabatic rapid passage in the 0-0 hyperfine transition of Rb-87
[AD-A158562] N86-16056
RUNWAYS
Concepts for the development of a nondestructive testing and evaluation system for rigid airfield pavements
[AD-A158004] N86-15324

S

S MATRIX THEORY
Nonlinear evolution equations associated with a Riemann-Hilbert scattering problem
[PREPRINT-458] N86-16030
SACCADIC EYE MOVEMENTS
Application of the system identification technique to goal-directed saccades
[AD-A159102] N86-15909
SAFETY
Light helicopter family trade-off analysis. Volume 10: Appendices V, W, X, and Z
[AD-A158079] N86-15309
SAFETY FACTORS
Workshop on Radiobiological Effectiveness of Neutrons
[DE85-017577] N86-16084
SAFETY MANAGEMENT
Summaries of Center for Fire Research grants and in-house programs, 1985
[NBSIR-85-3258] N86-15429
Assurance Program for Remedial Action (APRA) microcomputer-operated bibliography management system
[DE85-008763] N86-16155
SALINITY
Mizlant 84 data report results of an oceanographic cruise to the Greenland Sea, August-September 1984
[AD-A157997] N86-15845
SALYUT SPACE STATION
Determination of increment of Bacillus subtilis biomass in weightlessness N86-15861
SAMPLES
Antarctic Meteorite Newsletter, Volume 8, Number 2
[NASA-CR-176401] N86-16167
SAN FRANCISCO BAY (CA)
Airborne Doppler lidar activities N86-15793
SANDS
Bulletin of the Faculty of Engineering, Hokkaido University, no. 128
[ISSN-0385-602X] N86-15420
Deformation behavior of anisotropic sand during principal stress axes rotation N86-15421
SATELLITE IMAGERY
Studies of lightning data in conjunction with geostationary satellite data N86-15785
Detection of rotating thunderstorms using satellite imagery N86-15810
Studies of humid continental haze during SPACE N86-15813
Satellite microwave observations of a storm complex: A comparative analysis
[NASA-CR-176430] N86-15822
SATELLITE OBSERVATION
Utilization of satellite cloud information to diagnose the energy state and transformations in extratropical cyclones N86-15778
Application of satellite data to tropic/subtropic moisture coupling N86-15780
Studies of lightning data in conjunction with geostationary satellite data N86-15785
SATELLITE ORBITS
Venus-15, Venus-16 synthetic aperture radar on Venus satellite orbit N86-15510
SATELLITE SOUNDING
The assimilation of satellite soundings, winds and satellite products in a mesoscale analysis forecast system N86-15805
Time composite sounding N86-15808
Investigations of severe/tornadic thunderstorm development and evolution based on satellite and AVE/SESAME/VAS data N86-15809
Improved satellite retrievals and mesoscale moisture variability N86-15812
SATELLITE-BORNE PHOTOGRAPHY
Use of space shuttle photography in the study of meteorological phenomena
[AD-A159415] N86-15826
SATELLITE-BORNE RADAR
Venus-15, Venus-16 synthetic aperture radar on Venus satellite orbit N86-15510
SATURN RINGS
Cosmogonic scenario
[TRITA-EPP-85-04] N86-16175
Further explorations of cosmogonic shadow effects in the Saturnian rings
[NASA-CR-176441] N86-16177
SAUDI ARABIA
AL Jubayl/Dhahran, Saudi Arabia limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159605] N86-15830
SCALE MODELS
Test results from a dynamic model dynaflex rotor N86-15285
SCALING LAWS
Large aspect ratio, high-beta tokamak fusion reactor
[DE85-016654] N86-16122
SCATTERING
Bulletin of the Faculty of Engineering, Hokkaido University, no. 128
[ISSN-0385-602X] N86-15420
Crystal analyser mirror type down-scattering spectrometer using spallation neutron source N86-15425
Investigations of laser initiated discharge channels
[AD-A158872] N86-15660
The optical spectra of aerosols
[AD-A158057] N86-15758
SCATTERING FUNCTIONS
Time characteristics of scattering by radar targets N86-15512

SCHOTTKY DIODES
Noise characteristics of stroboscopic transducers built with GaAs microcircuit integration N86-15489
Self-guarding Schottky barrier infrared detector array [AD-D011894] N86-15541
Electrical characteristics of Si devices fabricated with completely consumed carbide (C3) dielectric isolation process [AD-A158296] N86-15547
Completely consumed carbide (C3) - A new process for dielectric isolation [AD-A158298] N86-15548
Photoluminescent response of palladium-cadmium sulfide and palladium-graded cadmium sulfoselenide Schottky diodes to molecular hydrogen [AD-A158759] N86-15552
SCHWARZ-CHRISTOFFEL TRANSFORMATION
Standardization of Schwarz-Christoffel transformation for engineering design of semiconductor and hybrid integrated-circuit elements N86-15620
SCREEN EFFECT
Investigations of the interference scattering and methods for its suppression in near-ground radar backscattering measurements [DFVLR-FB-85-42] N86-15539
Contribution to multilayer spherical screen theory N86-15571
SCREENS
Longitudinally slotted cylindrical shield with finite thickness and electrical conductance N86-15463
SCREWS
Stress analysis on screw thread [AD-A159347] N86-15693
SEA BREEZE
Airborne Doppler measurements of the central California extended sea breeze N86-15791
SEA ICE
Temporal and spatial distributions of Arctic Sea ice thickness and pressure ridging statistics [AD-A159577] N86-15849
SEA LEVEL
The effect of the wind in the Eemsmond (the Netherlands, West Germany) on high tide levels in Delfzijl (the Netherlands) [KNMI-TR-63] N86-15858
SEA WATER
165-kW open-cycle OTEC experiment [DE85-008818] N86-15735
SEALS (STOPPERS)
Dynamic response of film thickness in spiral-groove face seals [NASA-TP-2544] N86-15313
Production of glass or glass-ceramic to metal seals with the application of pressure [DE85-017746] N86-15403
SEAS
Mizlant 84 data report results of an oceanographic cruise to the Greenland Sea, August-September 1984 [AD-A157997] N86-15845
SEBACEOUS GLANDS
Gas chromatographic analysis of free fatty acids of skin surface lipids N86-15891
SECONDARY EMISSION
Textured carbon on copper: A novel surface with extremely low secondary electron emission characteristics [NASA-TP-2543] N86-15394
SEDIMENTS
The movement of a cluster of particles subject to the effect of gravity and their sedimentation onto a plane horizontal surface [BLL-RISLEY-TR-5161-(9091.9F)] N86-15623
The permeability and consolidation of deep sea sediments [IOS-201] N86-15855
SEISMIC WAVES
One-dimensional iterative inversion of vertical seismic profiles N86-15748
Seismic moment tensor recovery at low frequencies N86-15750
Development and evaluation of a regional seismic array in Norway [AD-A159129] N86-15761
SEISMOLOGY
A study of the strong ground motion of the western Hidaka, Hokkaido earthquake N86-15701
Seismic intensity survey and hypocenter recalculation on the 1985 Sapporo earthquake (M 3.5) N86-15702
One-dimensional iterative inversion of vertical seismic profiles N86-15748
Development and evaluation of a regional seismic array in Norway [AD-A159129] N86-15761
The seismicity of southern Sweden, 1979 - 1984 [FOA-C-20572-TI] N86-15765
SELECTION
On the least favorable configuration of a selection procedure based on ranks [AD-A159154] N86-16022
A lower confidence bound on the probability of a correct selection [AD-A159164] N86-16023
SEMANTICS
The revised report on Scheme or an uncommon Lisp [AD-A159423] N86-15963
SEMICONDUCTOR DEVICES
Surface passivation of semiconductor circuit elements with layer of wideband semiconductor N86-15485
Predicting and diagnosing performance of transistors, integrated circuits and large-scale-integration systems by multilevel simulation methods and programs N86-15487
Structural transformations in semiconductors during optical pumping N86-15490
Standardization of Schwarz-Christoffel transformation for engineering design of semiconductor and hybrid integrated-circuit elements N86-15620
DAASY (data acquisition and analysis system) [DE85-016341] N86-15971
Submicron phonics 1 [AD-A159421] N86-16131
SEMICONDUCTOR DIODES
Electrical characteristics of Si devices fabricated with completely consumed carbide (C3) dielectric isolation process [AD-A158296] N86-15547
Completely consumed carbide (C3) - A new process for dielectric isolation [AD-A158298] N86-15548
Photoluminescent response of palladium-cadmium sulfide and palladium-graded cadmium sulfoselenide Schottky diodes to molecular hydrogen [AD-A158759] N86-15552
SEMICONDUCTOR JUNCTIONS
Theoretical model of Hg(1-x)Cd(x)Te photovoltaic and photoconductive infrared detectors [AD-A158668] N86-15551
External locking of IMPATT-diode power oscillators N86-15618
SEMICONDUCTOR LASERS
Effect of optical injection on the optical properties of a (GaAl)As semiconductor laser: Optical bistability and four wave mixing [ENST-85E005] N86-15667
SEMICONDUCTORS (MATERIALS)
China report: Science and technology [JPRS-CST-85-038] N86-15438
Self-guarding Schottky barrier infrared detector array [AD-D011894] N86-15541
Novel approaches to passivation of Si for VHSIC - based on fundamental studies [AD-A158238] N86-15546
Novel transport and recombination processes in semiconductors [AD-A158321] N86-15549
Investigation of quantum effects in heterostructures [AD-A158327] N86-15550
Photoluminescent response of palladium-cadmium sulfide and palladium-graded cadmium sulfoselenide Schottky diodes to molecular hydrogen [AD-A158759] N86-15552
VLSI (Very Large Scale Integrated) design of a sixteen bit pipelined multiplier using three micron NMOS technology [AD-A159433] N86-15557
Modulation instability and solitons of electromagnetic wave envelopes in ferromagnetic semiconductors N86-15578
New type of impurity defects in semiinsulating gallium aresenide N86-15595
Picosecond photoconductivity of indium aresenide N86-15596
Microelectronics technology N86-15930
Submicron phonics 1 [AD-A159421] N86-16131
Selective anodic oxidation of semiconductors for pattern generation [AD-D011889] N86-16133
Structural and electrical characterization of polycrystalline semiconductor materials [DE85-012166] N86-16135
SENEGAL
Dakar senegal limited surface observations climatic summary (LISOCS). Parts A, c-f [AD-A159606] N86-15831
SENSITIVITY
Noise characteristics of stroboscopic transducers built with GaAs microcircuit integration N86-15489
Maximum attainable sensitivity of dc squids built with Josephson tunnel junctions N86-15619
Enhancing visual sensitivity [AD-A158799] N86-15906
SENSORS
Atmospheric Modeling And Sensor Simulation (AMASS) study N86-15815
Multispectral atmospheric mapping sensor of mesoscale water vapor features N86-15819
SEPARATED FLOW
Separated transonic airfoil flow calculations with a nonequilibrium turbulence model [NASA-TM-86830] N86-15247
A rapid method for estimating equivalent parabolic polars from wind-tunnel tests [AD-A159559] N86-15251
SEPTUM
Pulsed septum magnet for the Fermilab antiproton source [DE85-016993] N86-16078
SEQUENCING
Extreme value theory and dependence [AD-A159138] N86-16001
SERVICE LIFE
Mean residual life: Theory and applications [AD-A158589] N86-16013
SERVOMECHANISMS
Digital servocontroller system. Volume 2. Maintenance manual [AD-A159066] N86-15322
SHADOWGRAPH PHOTOGRAPHY
Fundamental study of flow field generated by rotorcraft blades using wide-field shadowgraph [NASA-CR-176443] N86-15249
SHAFTS (MACHINE ELEMENTS)
Machine with an intermittently rotating table for the performance of work operations [AD-D011911] N86-15669
SHALLOW WATER
A conservation law related to Kelvin's circulation theorem [AD-A157819] N86-15631
The TMA shallow-water spectrum description and applications [AD-A157975] N86-15844
Mizlant 84 data report results of an oceanographic cruise to the Greenland Sea, August-September 1984 [AD-A157997] N86-15845
Wave and surf forecast model evaluation for use on a micro computer [AD-A159063] N86-15848
SHAPE CONTROL
Generation of electromagnetic radiation in radio-frequency band in solids exposed to laser radiation N86-15509
SHEAR STRENGTH
Mechanical properties testing of candidate polymer matrix materials for use in high performance composites [NASA-CR-177970] N86-15349
SHEAR STRESS
Deformation behavior of anisotropic sand during principal stress axes rotation N86-15421
SHIELDING
Use of chemical explosives for emergency solar flare shelter construction and other excavations on the Martian surface [DE85-014131] N86-16176
SHIFT REGISTERS
Variable radix processor [AD-D011893] N86-15918
SHIPS
Effects of waves on the boundary layer of a surface-piercing body [AD-A158053] N86-15633
Mizlant 84 data report results of an oceanographic cruise to the Greenland Sea, August-September 1984 [AD-A157997] N86-15845
A comparison of the effects of circuit weight training on men and women [AD-A159419] N86-15910
SHOCK FRONTS
Analysis of dislocation kinetics across shocks [DE85-016444] N86-15638
On the growth rate of Rayleigh-Taylor instability at the decelerating shock front N86-16112
SHOCK TESTS
Potency of photoflash-produced retrograde amnesia in rats [AD-A159149] N86-15859
SHOCK WAVE INTERACTION
Numerical study of the laminar shock boundary layer interaction [DFVLR-FB-85-34] N86-15642
SHOCK WAVE PROPAGATION
Formulation of the Euler boundary value problem N86-15258
On the growth rate of Rayleigh-Taylor instability at the decelerating shock front N86-16112

SHOCK WAVES
Analysis of dislocation kinetics across shocks
[DE85-016444] N86-15638
Heterogeneous response of aluminum and lithium niobate to shock waves
[DE85-013963] N86-16140
SHORT CIRCUITS
Dependence of electric current through human body on parameters of 3-0 network in range of high insulation admittance N86-15588
SHORT WAVE RADIATION
Nonlinear analysis of a relativistic beam-plasma cyclotron instability
[AD-A159159] N86-16115
SHORT WAVE RADIO TRANSMISSION
Statistical characteristics of ultrashort-wave signal fast phase fluctuations based on amplitude measurements on sea lanes N86-15566
Adiabatic invariant value variation under shortwave band subcritical conditions N86-15572
SHOT NOISE
Noise characteristics of stroboscopic transducers built with GaAs microcircuit integration N86-15489
SIDESLIP
Hypersonic characteristics of an advanced aerospace plane at Mach 20.3
[NASA-TM-86435] N86-15245
SIEVES
Sieves and a filter for Gaussian processes
[AD-A158762] N86-15994
SIGNAL ANALYSIS
Estimating number and parameters of signal components in presence of noise N86-15567
SIGNAL DETECTION
Experiments in long-wavelength communication using modulated electron beam antennas: A parameter study
[AD-A157810] N86-15519
Detection of periodic signal of arbitrary shape with random time delay
[AD-A158979] N86-15524
Self-guarding Schottky barrier infrared detector array
[AD-D011894] N86-15541
Estimating number and parameters of signal components in presence of noise N86-15567
Efficiency of storing pulse products in coherent signal packets N86-15584
Localization of buried objects in water-saturated sand by variable incidence acoustic pulse reflections
[AD-A158064] N86-16043
Ultrasonic measurement of particles in a viscous fluid
[AD-A158989] N86-16046
SIGNAL DETECTORS
Acoustical imaging system evaluation
[AD-A159425] N86-15684
SIGNAL FADING
Optimum frequency of communication channel for indoor radio telemetry N86-15493
SIGNAL GENERATORS
Self-quenching streamer discharge characteristics at extreme gas compositions N86-15442
SIGNAL MEASUREMENT
Noise characteristics of stroboscopic transducers built with GaAs microcircuit integration N86-15489
SIGNAL PROCESSING
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-009] N86-15452
Selection of signals for digital optical channel N86-15471
An examination of some error correcting techniques for continuous speech recognition technology
[AD-A158001] N86-15521
Bipolar digitizer having compression capability
[AD-D011895] N86-15542
Modular floating decimal point operations for antenna array adaptation N86-15568
Lower limit of error probability in discrete addition of binary signals from parallel channels N86-15586
A computer model of peripheral auditory processing
[NPL-DITC-58/85] N86-16037
The experimental investigation of the inverse problem in rough surface scattering of acoustic waves
[AD-A158070] N86-16044
Research and development of an aimed magnetic lead current density-magnetic field diagnostic
[DE85-014720] N86-16060
SIGNAL RECEPTION
A new approach to signal registration with the emphasis on variable time delay estimation N86-15514
VHF-AM communications equipment selection and installation practices for helicopters
[DOT/FAA/PM-85/8] N86-15518
SIGNAL REFLECTION
Wavelength selective demultiplexer tuner
[AD-D011890] N86-15532
Localization of buried objects in water-saturated sand by variable incidence acoustic pulse reflections
[AD-A158064] N86-16043
SIGNAL TO NOISE RATIOS
Effect of antenna impedance mismatch on the signal-to-noise ratio of a radio receiving system
[AD-A159070] N86-15525
The detection of faint space object with solid state image detectors
[AD-A158594] N86-16166
SIGNAL TRANSMISSION
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-009] N86-15452
Methodology for determining dynamic characteristics of tristable-logic integrated circuits N86-15491
Optimum frequency of communication channel for indoor radio telemetry N86-15493
Underwater sound communication
[REPT-5-85] N86-16038
SIGNATURE ANALYSIS
Satellite passive microwave rain measurement techniques for land and ocean N86-15799
SIGNATURES
SAR (Synthetic Aperture Radar) data collection and processing summary - 1984 SARSEX (SAR internal wave signature experiment) experiment
[AD-A159440] N86-15530
SIGNIFICANCE
Significance of single particle effects in neutral beam weapon lethality
[DE85-012031] N86-16068
SILICIDES
Technological applications of Earth core research
[AD-A158991] N86-15759
SILICON
Self-guarding Schottky barrier infrared detector array
[AD-D011894] N86-15541
Electrical characteristics of Si devices fabricated with completely consumed carbide (C3) dielectric isolation process
[AD-A158296] N86-15547
Completely consumed carbide (C3) - A new process for dielectric isolation
[AD-A158298] N86-15548
Silicon compiler design of combinational and pipeline adder integrated circuits
[AD-A158995] N86-15555
Structural examination of iridium-based single-crystal preparations
[DE85-017550] N86-16136
SILICON CARBIDES
Fundamental studies and device development in beta silicon carbide
[AD-A159446] N86-16132
SILICON CONTROLLED RECTIFIERS
Experimental determination of turn-off time of high-voltage power thyristors N86-15602
SILICON DIOXIDE
Novel approaches to passivation of Si for VHSIC - based on fundamental studies
[AD-A158238] N86-15546
SILICON NITRIDES
Manufacture of dense sintered bodies containing silicon nitride
[NASA-TM-77929] N86-15396
Hot isostatic pressing of ceramics
[NASA-TM-77931] N86-15397
A two-terminal microelectrochemical diode with contact spacing of about one micron. A device based on one solution redox couple and one electrode-confined redox couple
[AD-A158774] N86-15553
SILICON OXIDES
Manufacture of dense sintered bodies containing silicon nitride
[NASA-TM-77929] N86-15396
SILICONES
The effect of environmental stress on Sylgard 170 silicone elastomer
[TI85-013268] N86-15407
SIMILITUDE LAW
Numerical study of the laminar shock boundary layer interaction
[DFVLR-FB-85-34] N86-15642
SIMPLIFICATION
Accuracy of polynomial approximation of quasi-minimax methods N86-15427
SIMULATION
Predicting and diagnosing performance of transistors, integrated circuits and large-scale-integration systems by multilevel simulation methods and programs N86-15487
Host groups: A multicast extension for datagram internetworks
[AD-A159146] N86-15526
Broadband simulation of multipath propagation in VHF mobile radio
[MBB-UA-905/85] N86-15540
Numerical simulation of viscous supersonic flow over a generic fighter configuration
[NASA-TM-86823] N86-15627
Atmospheric Modeling And Sensor Simulation (AMASS) study N86-15815
Validation of outgoing longwave radiation in the GLAS (Goddard Laboratory for Atmospheric Sciences) general circulation model
[AD-A158006] N86-15823
Experience and performance in video games and its influence on aptitude tests in aviation psychology
[DFVLR-FB-85-43] N86-15915
Random sequential coding by hamming distance
[AD-A158003] N86-15989
Research on intense electron beams and applications
[AD-A158234] N86-16055
MBE-4, a heavy ion multiple-beam experiment
[DE85-016626] N86-16064
Simulation of ion-beam in MID N86-16107
Alpha-burning in ICF target N86-16109
Solution of the field equations for 2-D electromagnetic direct implicit plasma simulation
[DE85-016073] N86-16123
Comparison of 2D memory SEU transport simulations with experiments
[DE85-016134] N86-16137
SIMULATORS
Recommendations for developing simulators of solar radiation penetrating to the Earth's surface N86-15603
SINE WAVES
Nonsinusoidal modes of oscillator with multifrequency surface-acoustic-wave resonator N86-15488
Efficiency of amplitude suppression on sinusoidal interference N86-15585
SINGLE CRYSTALS
Crystallographic fatigue crack propagation in single crystal nickel-base superalloy N86-15377
Characteristics of electrophysical and photoelectric properties of MOS-structures on indium arsenide N86-15486
Thin superconducting film characterization by surface acoustic waves
[AD-A158311] N86-16127
Preparation and properties of transition metal beta aluminas
[AD-A159408] N86-16130
Structural examination of iridium-based single-crystal preparations
[DE85-017550] N86-16136
Heterogeneous response of aluminum and lithium niobate to shock waves
[DE85-013963] N86-16140
SINGULARITY (MATHEMATICS)
Residues of integrals with three-dimensional multipole singularities, with application to the Lagally theorem
[AD-A158771] N86-15995
SINTERING
Manufacture of dense sintered bodies containing silicon nitride
[NASA-TM-77929] N86-15396
SITE SELECTION
A review of biological processes within oceanic water columns relevant to the assessment of the safety of disposal of waste, notably radioactive isotopes, on or within the seabed
[IOS-198] N86-15745
SIZE DETERMINATION
Particle sizing with whisker collectors — flow visualization
[ISL-CO-230/84] N86-15639
Droplet size and evaporation rate within a two-phase flow by morphology-dependent resonances in the optical spectra
[AD-A158931] N86-16091
SKIN (ANATOMY)
Gas chromatographic analysis of free fatty acids of skin surface lipids N86-15891
SKIN (STRUCTURAL MEMBER)
A cascade diffusion theory of sink capture fluctuations during irradiation of a solid
[ORNL-6123] N86-15356
SKIN TEMPERATURE (BIOLOGY)
Human thermoregulatory responses to cold air are altered by repeated cold water immersion
[AD-A158871] N86-15904
SLIP FLOW
Transient three phase, three component flow. Part 2: One-dimensional slip model, comparison theory-experiment
[KFK-3926-PT-2] N86-15646
SLOPES
Development of slope spectra of the wind-disturbed water surface N86-15842

Wave and surf forecast model evaluation for use on a micro computer
[AD-A159063] N86-15848

SLOT ANTENNAS
Longitudinally slotted cylindrical shield with finite thickness and electrical conductance N86-15463

SLURRIES
Antimisting kerosene: Development of a continuous 10 GPM in-line blender
[NASA-CR-176432] N86-15412

SMOG
Variability of major organic components in aircraft fuels
[AD-A159057] N86-15415

SMOKE
Geophysical Bulletin of Hokkaido University, no. 46
[ISSN-0439-3503] N86-15695
The reduction of nocturnal cooling value by smudging N86-15696

SNOW
Formulas concerning nonelectrical properties of snow: The electrical engineer's point of view
[REPT-S-156] N86-15715
Mixing formulas and experimental results of the dielectric constant of snow
[REPT-S-158] N86-15717

SNOW COVER
Biochemical processes in sagebrush ecosystems: Interactions with terrain
[E86-10015] N86-15705

SODIUM
The twilight sodium layer
[INPE-3568-PRE/773] N86-15754

SODIUM CHLORIDES
Experimental investigation of acoustic wave electrical excitation in electrolyte solution N86-15621
Intense e-beam interaction with matter
[DE85-017093] N86-16063

SOFTWARE ENGINEERING
Robotron hardware compatible programming languages surveyed N86-15474
LAMPS software and mesoscale prediction studies N86-15801
Code developer's guide to the Styx Liaison Library: A software interface for accessing and manipulating Styx opacity data
[DE85-014253] N86-16160

SOFTWARE TOOLS
Code developer's guide to the Styx Liaison Library: A software interface for accessing and manipulating Styx opacity data
[DE85-014253] N86-16160

SOIL MECHANICS
Modeling of concrete, soil, and interfaces
[AD-A158062] N86-15432
Spring stiffnesses for beam-column analysis of soil-structure interaction problems
[AD-A158072] N86-15690
Biochemical processes in sagebrush ecosystems: Interactions with terrain
[E86-10015] N86-15705

SOIL MOISTURE
Biochemical processes in sagebrush ecosystems: Interactions with terrain
[E86-10015] N86-15705

SOILS
Migration of hazardous substances through soil. Part 2: Determination of the leachability of metals from five industrial wastes and their movement within soil
[AD-A158990] N86-15740

SOLAR CELLS
Monolithic cascade-type solar cells
[NASA-TM-77926] N86-15731
DLTS (Deep-Level Transient Spectroscopy) analysis of germanium and Al sub x Ga sub 1-x As solar cells
[AD-A159114] N86-15732

SOLAR COLLECTORS
Influence of embedded electrical fields on temperature stability of parameters of I-Ga-As heterophotoelements N86-15615
Development and fabrication of photovoltaic concentrator modules for a point-focus Fresnel lens array
[DE85-017322] N86-15734
Analysis of a direct radiation solar dehumidification system
[DE85-008820] N86-15736

SOLAR CONSTANT
Measurement of radiation intensity on the IEA SSPS/CRS solar tower plant in Spain
[DFVLR-FB-85-36] N86-15739

SOLAR CORONA
Solar coronal white light, Fe 10, Fe 14 and Ca 15 observations during 1984: An atlas of synoptic charts
[PB85-191013] N86-16179
White light solar corona: An atlas of 1984 K-coronameter synoptic charts, December 1983 - January 1985
[PB85-191021] N86-16180

SOLAR COSMIC RAYS
Recommendations for developing simulators of solar radiation penetrating to the Earth's surface N86-15603
Solar-geophysical data number 486, February 1985. Part 1 (Prompt reports): Data for January 1985, December 1984 and late data
[PB85-196715] N86-16181

SOLAR ENERGY ABSORBERS
Measurement of radiation intensity on the IEA SSPS/CRS solar tower plant in Spain
[DFVLR-FB-85-36] N86-15739

SOLAR ENERGY CONVERSION
Monolithic cascade-type solar cells
[NASA-TM-77926] N86-15731

SOLAR FLARES
Use of chemical explosives for emergency solar flare shelter construction and other excavations on the Martian surface
[DE85-014131] N86-16176
Solar-geophysical data number 486, February 1985. Part 1 (Prompt reports): Data for January 1985, December 1984 and late data
[PB85-196715] N86-16181
Solar-geophysical data number 586, February 1985. Part 2 (Comprehensive reports). Data for August 1984, March - June 1982 and miscellanea
[PB85-196723] N86-16182

SOLAR MAGNETIC FIELD
Solar-geophysical data number 486, February 1985. Part 1 (Prompt reports): Data for January 1985, December 1984 and late data
[PB85-196715] N86-16181

SOLAR PONDS (HEAT STORAGE)
User's manual for Massachusetts Institute of Technology Solar Thermal Pond Program (MITSOL)
[DE85-012147] N86-15733

SOLAR PROMINENCES
Solar coronal white light, Fe 10, Fe 14 and Ca 15 observations during 1984: An atlas of synoptic charts
[PB85-191013] N86-16179
Solar-geophysical data number 586, February 1985. Part 2 (Comprehensive reports). Data for August 1984, March - June 1982 and miscellanea
[PB85-196723] N86-16182

SOLAR RADIATION
Recommendations for developing simulators of solar radiation penetrating to the Earth's surface N86-15603
Analysis of a direct radiation solar dehumidification system
[DE85-008820] N86-15736
Radiation pressure and the geocorona N86-15749
Studies of humid continental haze during SPACE N86-15813

SOLAR RADIATION SHIELDING
Solar rocket absorber
[AD-D011897] N86-15336

SOLAR RADIO BURSTS
Short-lived solar burst spectral component at approximately 100 GHz
[INPE-3550-PRE/762] N86-16178
Solar-geophysical data number 586, February 1985. Part 2 (Comprehensive reports). Data for August 1984, March - June 1982 and miscellanea
[PB85-196723] N86-16182

SOLAR RADIO EMISSION
Solar-geophysical data number 486, February 1985. Part 1 (Prompt reports): Data for January 1985, December 1984 and late data
[PB85-196715] N86-16181

SOLAR WIND
Solar coronal white light, Fe 10, Fe 14 and Ca 15 observations during 1984: An atlas of synoptic charts
[PB85-191013] N86-16179
Solar-geophysical data number 486, February 1985. Part 1 (Prompt reports): Data for January 1985, December 1984 and late data
[PB85-196715] N86-16181

SOLAR X-RAYS
Short-lived solar burst spectral component at approximately 100 GHz
[INPE-3550-PRE/762] N86-16178
Solar-geophysical data number 586, February 1985. Part 2 (Comprehensive reports). Data for August 1984, March - June 1982 and miscellanea
[PB85-196723] N86-16182

SOLAR-PUMPED LASERS
Solar-pumped solid state Nd lasers
[NASA-TM-87615] N86-15658

SOLID PROPELLANT ROCKET ENGINES
Multi-dimensional combustion instability analysis of solid propellant rocket motors
[AD-A158314] N86-15414

SOLID ROCKET PROPELLANTS
Simultaneous incremental strain/incremental temperature analog device for, and method, of testing for stress response
[AD-D011912] N86-15411

SOLID STATE
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-011] N86-15484

SOLID STATE DEVICES
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-009] N86-15452
Active microwave filters N86-15467
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-006] N86-15561
The detection of faint space object with solid state image detectors
[AD-A158594] N86-16166

SOLID STATE LASERS
Solar-pumped solid state Nd lasers
[NASA-TM-87615] N86-15658
Beta alumina: A solid-electrolyte as a solid-state laser host
[AD-A159409] N86-15664

SOLIDS
A cascade diffusion theory of sink capture fluctuations during irradiation of a solid
[ORNL-6123] N86-15356
Computer simulation of nonequilibrium processes
[DE85-015708] N86-16036
Intense e-beam interaction with matter
[DE85-017093] N86-16063

SOLVENTS
Moldable electrically conductive polymer compositions
[AD-D011887] N86-15402

SOMMERFELD WAVES
Exact image method for impedance computation of antennas above the ground
[REPT-S-161] N86-15535

SOOT
Variability of major organic components in aircraft fuels
[AD-A159057] N86-15415
Fuel effects on soot formation in turbojet engines
[AD-A159073] N86-15416

SORBENTS
Novel sorbents for high temperature regenerative H2S removal
[NASA-CR-176449] N86-15360

SOUND FIELDS
The broadband normal mode model PROTEUS
[AD-A159091] N86-16048

SOUND PROPAGATION
On second propagation in radial fan casings
[DFVLR-FB-85-32] N86-16053

SOUND TRANSMISSION
Underwater sound communication
[REPT-5-85] N86-16038
Optimum frequency for propagation of sound in shallow sound channels
[AD-A159064] N86-16047

SOUND WAVES
Description, analysis, and prediction of sea-floor roughness using spectral models
[AD-A158000] N86-15846

SOUTH KOREA
Yongsan Reservation, Korea limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159610] N86-15835

SOUTHERN CALIFORNIA
Paleomagnetism and tectonics of the central and eastern Transverse Ranges, Southern California N86-15747

SPACE CHARGE
Transportable charge in a periodic alternating gradient system
[DE85-015664] N86-16085

SPACE DETECTION AND TRACKING SYSTEM
Naval space surveillance modernized receiver system. Volume 6: Data communications subsystem
[AD-A158465] N86-15523

SPACE EXPLORATION
A proposed technique for the Venus balloon telemetry and Doppler frequency recovery
[NASA-CR-176448] N86-15333

SPACE INFRARED TELESCOPE FACILITY
BASD: SIRTF Telescope Instrument Changeout and Cryogen Replenishment (STICCR) study
[NASA-CR-177381] N86-15334

SPACE MAINTENANCE
BASD: SIRTF Telescope Instrument Changeout and Cryogen Replenishment (STICCR) study
[NASA-CR-177381] N86-15334

SPACE PROGRAMS
Space activities of the United States, Soviet Union and other launching countries/organizations, 1957-1984
[GPO-46-504] N86-15330

SPACE SHUTTLES
Catalytic surface effects on contaminated space shuttle tile in a dissociated nitrogen stream
[NASA-TM-86770] N86-15335
Techniques for fatigue life predictions from measured strains
[NASA-CR-178574] N86-15688
First Meeting of the Working Group on the Shuttle Microwave Precipitation Radiometer (SMPR) N86-15820
Use of space shuttle photography in the study of meteorological phenomena
[AD-A159415] N86-15826
SPACE STATIONS
Space station propulsion requirements study
[NASA-CR-174934] N86-15339
SPACE SURVEILLANCE (GROUND BASED)
Naval space surveillance modernized receiver system. Volume 6: Data communications subsystem
[AD-A158465] N86-15523
SPACEBORNE EXPERIMENTS
Multiscale modeling to evaluate proposed space-based Doppler lidar sampling strategies N86-15774
Space shuttle/mesoscale lightning experiment N86-15787
SPACEBORNE LASERS
Solar-pumped solid state Nd lasers
[NASA-TM-87615] N86-15658
SPACEBORNE PHOTOGRAPHY
Space shuttle/mesoscale lightning experiment N86-15787
SPACECRAFT COMMUNICATION
A proposed technique for the Venus balloon telemetry and Doppler frequency recovery
[NASA-CR-176448] N86-15333
Main trends in satellite communication and broadcasting research N86-15494
Research in adaptive beamforming for satellite communications
[AD-A157828] N86-15520
SPACECRAFT CONSTRUCTION MATERIALS
Studies of molecular properties of polymeric materials: Aerospace environmental effects on three linear polymers
[NASA-TM-87532] N86-15391
Studies of molecular properties of polymeric materials: Aerospace environmental effects on three linear polymers (polymer durability) N86-15392
Radio-frequency electrical properties of some neat and metal-doped polyimides N86-15393
SPACECRAFT CONTROL
West Europe report: Science and technology
[JPRS-WST-85-015] N86-15443
CNES of France researches remote control system for space N86-15444
SPACECRAFT ENVIRONMENTS
Radiation mapping on Spacelab 1: Experiment no. INS006
[NASA-CR-171893] N86-15332
Functional state of the olfactory analyzer in a pressurized environment N86-15890
SPACECRAFT PROPULSION
Space station propulsion requirements study
[NASA-CR-174934] N86-15339
SPACECRAFT SHIELDING
Material shields against neutral atomic particle beams
[AD-A159445] N86-16058
SPACECRAFT TRACKING
A proposed technique for the Venus balloon telemetry and Doppler frequency recovery
[NASA-CR-176448] N86-15333
SPACELAB
Radiation mapping on Spacelab 1: Experiment no. INS006
[NASA-CR-171893] N86-15332
SPALLATION
Bulletin of the Faculty of Engineering, Hokkaido University, no. 128
[ISSN-0385-602X] N86-15420
Crystal analyser mirror type down-scattering spectrometer using spallation neutron source N86-15425
SPARK GAPS
Improved lifetime high voltage switch electrode
[AD-A158961] N86-15554
SPARKS
Improved lifetime high voltage switch electrode
[AD-A158961] N86-15554
SPATIAL DISTRIBUTION
A consistent spatial differencing scheme for the transonic full-potential equation in three dimensions
[NASA-TM-86716] N86-15246
A synoptic and mesoscale study of a frequent lightning event
[AD-A158225] N86-15825
Temporal and spatial distributions of Arctic Sea ice thickness and pressure ridging statistics
[AD-A159577] N86-15849
SPATIAL RESOLUTION
Influence of roughness of ends of fiber optic plates on modulation transfer coefficient N86-15508
Evaluation of spatial, radiometric and spectral Thematic Mapper performance for coastal studies
[E86-10016] N86-15706
Severe storm identification with satellite microwave radiometry: An initial investigation with Nimbus-7 SMMR data
[NASA-CR-176431] N86-15821
SPECTRA
The Dowling wall pressure-spectrum analogy applied to an isotropic two-layered elastic medium
[AD-A158009] N86-15632
SPECTRAL ENERGY DISTRIBUTION
Photoluminescent response of palladium-cadmium sulfide and palladium-graded cadmium sulfoselenide Schottky diodes to molecular hydrogen
[AD-A158759] N86-15552
Project HERO: Heating Rocket Experiments. The H and E field probe (HESO): In situ measurements of plasma parameters in the ionospheric plasma modified by electromagnetic waves of high intensity
[BMFT-FB-W-85-009] N86-15766
The TMA shallow-water spectrum description and applications
[AD-A157975] N86-15844
Search for positron annihilation line and continuum radiation from the Galactic Center
[DE85-013964] N86-16169
SPECTRAL METHODS
Backlund transformations: Tools to find novel integrable evolution equations
[PREPRINT-443] N86-16009
SPECTRAL REFLECTANCE
Development of radiative cooling materials, phase 3
[DE85-014666] N86-15404
Integrating sphere spectrometer for high-temperature materials characterization
[DE85-012170] N86-15656
Systematic and random variations in digital Thematic Mapper data
[E86-10018] N86-15711
SPECTRAL RESOLUTION
Evaluation of spatial, radiometric and spectral Thematic Mapper performance for coastal studies
[E86-10016] N86-15706
Remote reconnaissance of submerged aquatic vegetation: A radiative transfer approach N86-15708
SPECTROMETERS
Bulletin of the Faculty of Engineering, Hokkaido University, no. 128
[ISSN-0385-602X] N86-15420
Crystal analyser mirror type down-scattering spectrometer using spallation neutron source N86-15425
Integrating sphere spectrometer for high-temperature materials characterization
[DE85-012170] N86-15656
SPECTROSCOPY
Spectroscopic studies of detonating heterogeneous explosives
[DE85-007687] N86-15419
DLTS (Deep-Level Transient Spectroscopy) analysis of germanium and Al sub x Ga sub 1-x As solar cells
[AD-A159114] N86-15732
Time-resolved measurement of energy and species of an intense pulsed ion beam N86-16104
Laser intracavity absorption as a plasma diagnostic aid
[DE85-015741] N86-16120
SPECTRUM ANALYSIS
DLTS (Deep-Level Transient Spectroscopy) analysis of germanium and Al sub x Ga sub 1-x As solar cells
[AD-A159114] N86-15732
Multispectral atmospheric mapping sensor of mesoscale water vapor features N86-15819
Merits and demerits of the Maximum Entropy Spectral Analysis (MESA) method
[INPE-3590-PRE/787] N86-16012
SPEECH RECOGNITION
Prosodic analysis by rule
[BR94770] N86-15516
An examination of some error correcting techniques for continuous speech recognition technology
[AD-A158001] N86-15521
Possibility of artificial intelligence in computers N86-15944
Belorussian computer speaks, reads graphics, X-rays N86-15945
SPEED INDICATORS
Dynamic characteristics of air data sensor systems: Altimeter, speedometer and alpha times beta vane
[NAL-TR-852] N86-15312
SPERMATOGENESIS
Tritium ingestion in rats N86-15895
SPHERES
Integrating sphere spectrometer for high-temperature materials characterization
[DE85-012170] N86-15656
SPHERICAL COORDINATES
Analysis of elliptical waveguides in cylindrical reference basis N86-15612
SPHEROMAKS
Magnetohydrodynamic stability of spheromak plasma in toroidal flux conserver with rectangular cross section. Part 2: Application of Mercier criterion
[IPPJ-743] N86-16114
SPILLING
Variability of major organic components in aircraft fuels
[AD-A159057] N86-15415
SPIN DYNAMICS
Novel transport and recombination processes in semiconductors
[AD-A158321] N86-15549
Color post-processor for the EPIC-2 computer program
[AD-A159321] N86-15961
Spin dynamics of a Cu-Mn spin glass alloy
[DE85-016295] N86-16134
SPLINE FUNCTIONS
Laplacian smoothing splines with generalized cross validation for objective analysis of meteorological data
[AD-A159336] N86-16006
SPOILERS
Results of wind tunnel tests on external combustion
[DFVLR-FB-85-35] N86-15643
SPRAY NOZZLES
Droplet sizing research
[AD-A158318] N86-15653
SPUTTERING
Bulletin of the Faculty of Engineering, Hokkaido University, no. 128
[ISSN-0385-602X] N86-15420
A study of reactive sputter etching for carbon steel by Freon gas: On the effect of oxygen gas mixture N86-15422
SQUALLS
A synoptic and mesoscale study of a frequent lightning event
[AD-A158225] N86-15825
SQUID (DETECTORS)
Sensitivity of squids built with low-capacitance Josephson tunnel junctions N86-15617
Maximum attainable sensitivity of dc squids built with Josephson tunnel junctions N86-15619
STABILITY
Dynamic stability of a bearingless circulation control rotor blade in hover N86-15297
China reaches new level in minicomputer development N86-15440
Methodology for determining dynamic characteristics of tristable-logic integrated circuits N86-15491
Mathematical problems in stability, control and reliability of random access communication systems
[AD-A159402] N86-15529
Tubular strong-current relativistic electron beam instability N86-15592
Observational and theoretical studies of the evolving structure of baroclinic waves: Attractor dynamics of global weather systems N86-15781
Analysis of microscopic instability for rotating LIB N86-16106
On the growth rate of Rayleigh-Taylor instability at the decelerating shock front N86-16112
STABILIZATION
Nonsinusoidal modes of oscillator with multifrequency surface-acoustic-wave resonator N86-15488
Modal analysis of unstable resonators
[AD-A159225] N86-15663
STABLE OSCILLATIONS
Self-modulation instability of gyrotron emission N86-15501
STAINLESS STEELS
The application of diffusion theory to the analysis of hydrogen desorption data at 25 deg C
[NASA-TM-86531] N86-15359
The role of hydrogen embrittlement in intergranular stress corrosion cracking of sensitized type 304 stainless steel
[TI85-014965] N86-15386
STATIC LOADS
Hypersonic characteristics of an advanced aerospace plane at Mach 20.3
[NASA-TM-86435] N86-15245

Proving ring calibrations using a deadweight pressure system
[RFP-3677] N86-15650

STATICS
Further informational properties of the Nash and Stackelberg solutions of LQG games
[AD-A158569] N86-15993

STATIONS
Single station assessment of atmospheric boundary layer properties in the eastern Mediterranean Sea
[AD-A159432] N86-15827

STATISTICAL ANALYSIS
Statistical characteristics of ultrashort-wave signal fast phase fluctuations based on amplitude measurements on sea lanes N86-15566
Statistical analysis and use of VAS radiance data N86-15811
A re-analysis of SWOP data --- Stereo Wave Observation Project (SWOP)
[IOS-195] N86-15853
Statistical research on problems of biodynamics
[AD-A157993] N86-15899
Extreme value theory and dependence
[AD-A159138] N86-16001
On the least favorable configuration of a selection procedure based on ranks
[AD-A159154] N86-16022

STATISTICAL DISTRIBUTIONS
Temporal and spatial distributions of Arctic Sea ice thickness and pressure ridging statistics
[AD-A159577] N86-15849
Non-uniform bounds of normal approximation for finite-population U-statistics
[AD-A159163] N86-16003
On the number of bootstrap simulations required to construct a confidence interval
[AD-A158880] N86-16016
Multiple decision procedures for Tukey's generalized lambda distributions
[AD-A159153] N86-16021

STATISTICAL MECHANICS
Computer simulation of nonequilibrium processes
[DE85-015708] N86-16036

STATISTICAL TESTS
Tests for a change-point
[AD-A159381] N86-16025

STEADY FLOW
Objectives and scope of the Working Group 07 N86-15257

STEADY STATE
Formulation of the Euler boundary value problem N86-15258
Steady state penetration of rigid perfectly plastic targets
[AD-A158081] N86-15670

STEAM
Preliminary results of velocities and deceleration of aluminum, magnesium, zirconium, tantalum, pyrofuze and titanium particles burning in steam
[AD-A159141] N86-15365
Burning time and size of aluminum, magnesium, zirconium, tantalum, and pyrofuze particles burning in steam
[AD-A159161] N86-15366

STEELS
Combined mode 1 - mode 3 fracture toughness of high-strength low-alloy steel N86-15376
Probabilistic analysis of steel containment strength with internal pressure
[DE85-015520] N86-15389
The Dowling wall pressure-spectrum analogy applied to an isotropic two-layered elastic medium
[AD-A158009] N86-15632

STELLAR MODELS
Stellar core collapse and supernova
[DE85-017396] N86-16172

STELLAR RADIATION
Emission region of gamma ray bursts
[DE85-013198] N86-16183

STEREOCHEMISTRY
United States Air Force Academy, Department of Chemistry Research: AY 1983-1984
[AD-A159319] N86-15343

STEREOPHOTOGRAPHY
A re-analysis of SWOP data --- Stereo Wave Observation Project (SWOP)
[IOS-195] N86-15853

STEREOSCOPIC VISION
Binocular image flows: Steps toward stereo - motion fusion
[AD-A158089] N86-15901

STIFFNESS
Mechanical properties testing of candidate polymer matrix materials for use in high performance composites
[NASA-CR-177970] N86-15349

STIMULATED EMISSION DEVICES
FRG turns efforts to laser development N86-15436

STIMULATION
Subnanosecond short wavelength generation using optical fibers
[AD-A158769] N86-16090

STIRLING CYCLE
Creep rupture behavior of Stirling engine materials
[NASA-TM-87209] N86-15380
Assessment of dynamic energy conversion systems for radioisotope heat sources
[DE85-016202] N86-15737
Ceramic automotive Stirling engine study
[NASA-CR-174907] N86-16165

STOCHASTIC PROCESSES
Description, analysis, and prediction of sea-floor roughness using spectral models
[AD-A158000] N86-15846
Stochastic differential equations for neuronal behavior
[AD-A159099] N86-15908
Extreme value theory and dependence
[AD-A159138] N86-16001
Stochastic integration for operator valued processes on Hilbert spaces and on nuclear spaces
[AD-A158878] N86-16014
Degenerate multivariate stationary processes: Basicity, past and future, and autoregressive representation
[AD-A158879] N86-16015
Stochastic integrals and processes with independent increments
[AD-A158939] N86-16017
On the angle for stationary random fields
[AD-A158982] N86-16018
On determining the predictor of Non-Full-Rank multivariate stationary random processes
[AD-A159165] N86-16024
Stochastic theory of emission and absorption of quanta
[NOTA-INTERNA-847] N86-16147

STONY METEORITES
Cosmogenic neutron-capture-produced nuclides in stony meteorites
[DE85-012689] N86-16170

STORM ENHANCEMENT
Detection of rotating thunderstorms using satellite imagery N86-15810

STORMS
Severe storm electricity N86-15783
Remote sensing of severe convective storms N86-15800
Severe storm identification with satellite microwave radiometry: An initial investigation with Nimbus-7 SMMR data
[NASA-CR-176431] N86-15821

STORMS (METEOROLOGY)
A summary of research on mesoscale energetics of severe storm environments N86-15807

STRAIN MEASUREMENT
Techniques for fatigue life predictions from measured strains
[NASA-CR-178574] N86-15688
Techniques for fatigue life predictions from measured strains. Appendix E: HPOTP bearing cartridge and MCC coolant inlet duct power spectral densities
[NASA-CR-178515] N86-15689

STRAKES
Use of hinged strakes for lateral control at high angles of attack
[AD-A158005] N86-15321

STRATEGY
Practical guidelines for testing Ada programs
[AD-A158099] N86-15951

STRATIFICATION
The effect of the Benthic Boundary Layer on the physics of intense mesoscale eddies N86-15751

STRATIFIED FLOW
Theoretical and experimental studies in support of the Geophysical Fluid Flow Experiment N86-15772

STRATOSPHERE
Measurements of statospheric ozone by indigo decoloration N86-15763

STREAK PHOTOGRAPHY
Development of a photonic data recorder
[DE85-017120] N86-15655

STREAM FUNCTIONS (FLUIDS)
A consistent spatial differencing scheme for the transonic full-potential equation in three dimensions
[NASA-TM-86716] N86-15246

STREAMS
Water resources data for California, water year 1983. Volume 3: Southern Central Valley Basins and the Great Basin from Walker River to Trucker River
[PB85-232312] N86-15720

STRESS (PHYSIOLOGY)
Intensity of lipid peroxidation in hypokinetic rat tissues N86-15876
Can aircraft noise less than or equal 115 to dBA adversely affect reproductive outcome in USAF women?
[AD-A158322] N86-16045

STRESS (PSYCHOLOGY)
USSR report: Space Biology and Aerospace Medicine, volume 19, no. 4, July - August 1985
[JPRS-USB-85-006] N86-15865

STRESS ANALYSIS
Effect of stress concentrations in composite structures
[NASA-CR-176410] N86-15348
Simultaneous incremental strain/incremental temperature analog device for, and method, of testing for stress response
[AD-D011912] N86-15411
Deformation behavior of anisotropic sand during principal stress axes rotation N86-15421
Stress analysis on screw thread
[AD-A159347] N86-15693
Effect of threat stress on psychomotor stability of pilots differing in anxiety level N86-15869
Use of flight simulators for demonstration of functional capacities of flight personnel N86-15870

STRESS CONCENTRATION
Concepts for the development of a nondestructive testing and evaluation system for rigid airfield pavements
[AD-A158004] N86-15324
Effect of stress concentrations in composite structures
[NASA-CR-176410] N86-15348
Stress concentration around a small circular hole in the HiMAT composite plate
[NASA-TM-86038] N86-15350

STRESS CORROSION CRACKING
The role of hydrogen embrittlement in intergranular stress corrosion cracking of sensitized type 304 stainless steel
[TI85-014965] N86-15386

STRESS INTENSITY FACTORS
Application of fracture mechanics principles to fatigue crack growth in a powder metallurgy Ni-base superalloy N86-15372

STRESS MEASUREMENT
Profile fitting in residual stress determination
[AD-A158881] N86-15691

STRESS RELIEVING
Effects of chemistry and processing on the fracture related properties of P/M alloy CT91
[AD-A159299] N86-15383

STRESSES
Steady state penetration of rigid perfectly plastic targets
[AD-A158081] N86-15670

STRETCHING
Quasi nonstretching hypervelocity jets
[ISL-CO-236/84] N86-15254

STRIP TRANSMISSION LINES
Strip and microstrip line periodic heterogeneities N86-15608

STROBOSCOPES
Noise characteristics of stroboscopic transducers built with GaAs microcircuit integration N86-15489

STRONTIUM 90
Worldwide deposition of (90)Sr through 1983
[DE85-017599] N86-15741

STRUCTURAL ANALYSIS
Planning, creating and documenting a NASTRAN finite element model of a modern helicopter N86-15300
Analysis of potential helicopter vibration reduction concepts N86-15302
Flutter generator control and force computer
[AEL-0242-TM] N86-15318
Modeling of concrete, soil, and interfaces
[AD-A158062] N86-15432
Activities and results report for the special domain 210 --- fluid mechanics
[KU-SFB-210/A/11] N86-15645
The equal flow problem
[AD-A159594] N86-16028
Ceramic automotive Stirling engine study
[NASA-CR-174907] N86-16165

STRUCTURAL DESIGN
Expert systems in engineering practice
[ISBN-90-6818-018-5] N86-15977

STRUCTURAL DESIGN CRITERIA
Temperature and humidity data for design: British forces area of West Germany
[MET-O-MEMO-113] N86-15767

STRUCTURAL PROPERTIES (GEOLOGY)
Modeling of concrete, soil, and interfaces
[AD-A158062] N86-15432

SUBMERGING
Effect of dry immersion model on parameters of fluid-electrolyte metabolism, blood plasma aldosterone and cortisol levels in individuals differing in body fluid content N86-15875

SUBROUTINES
An interactive discrete controls analysis option (ORACLS) for the CONTROLS analysis package on the IBM 3033
[AD-A158754] N86-15956
Color post-processor for the EPIC-2 computer program
[AD-A159321] N86-15961
SUBSONIC FLOW
Investigation of large scale structures in a subsonic free jet
[DFVLR-FB-85-38] N86-15644
SUBSONIC SPEED
The experimental determination of the subsonic aerodynamic characteristics of an Ogive-Cylinder body including a comparison with theoretical estimates, volume 1
[CAR-8509] N86-15242
SUBSTITUTES
Use of new polyurethane in leather substitute N86-15410
SUBSTRATES
TiN hard coating by reactive ion-plating
[BLL-RISLEY-TR-5112-(9091.9F)] N86-15371
Textured carbon on copper: A novel surface with extremely low secondary electron emission characteristics
[NASA-TP-2543] N86-15394
Surface passivation of semiconductor circuit elements with layer of wideband semiconductor N86-15485
Characteristics of electrophysical and photoelectric properties of MOS-structures on indium arsenide N86-15486
Self-guarding Schottky barrier infrared detector array
[AD-D011894] N86-15541
A two-terminal microelectrochemical diode with contact spacing of about one micron. A device based on one solution redox couple and one electrode-confined redox couple
[AD-A158774] N86-15553
Micron-spaced platinum interdigitated array electrode: Fabrication, theory and initial use
[AD-A159429] N86-15556
SUCTION
Laminar flow control with suction: Theory and experiment N86-15269
SULFUR
The catalytic activity and selectivity of chemical treated clinoptilolite in the conversion of methanol N86-15424
SULFUR DIOXIDES
Controlling acidic deposition: Targeted strategies for reducing sulfur dioxide emissions
[DE85-015058] N86-15742
Proposals for acid-rain control from the 98th Congress
[DE85-015268] N86-15744
SUMMARIES
Kitzingen AI, Germany limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159604] N86-15829
AL Jubayl/Dhahran, Saudi Arabia limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159605] N86-15830
Dakar senegal limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159606] N86-15831
SUMMER
Condensation potential in high thermal performance walls. Hot, humid summer climate
[AD-A158002] N86-15431
Optimum frequency for propagation of sound in shallow sound channels
[AD-A159064] N86-16047
SUPERCHARGERS
A computer simulation of the turbocharged turbo compounded diesel engine system: A description of the thermodynamic and heat transfer models
[NASA-CR-174971] N86-16164
SUPERCOMPUTERS
Computational fluid dynamics at NASA Ames and the numerical aerodynamic simulation program
[NASA-TM-86769] N86-15626
SUPERCONDUCTIVITY
Superconducting linacs: Some recent developments
[DE85-014972] N86-16081
Superconducting resonators for the University of Washington booster linac
[DE85-017419] N86-16124
SUPERCONDUCTORS
Internal conditions for self excitation of superconductor DC generators N86-15606
Thin superconducting film characterization by surface acoustic waves
[AD-A158311] N86-16127
SUPERCRITICAL AIRFOILS
Separated transonic airfoil flow calculations with a nonequilibrium turbulence model
[NASA-TM-86830] N86-15247
SUPERFLUIDITY
BASD: SIRTF Telescope Instrument Changeout and Cryogen Replenishment (STICCR) study
[NASA-CR-177381] N86-15334
SUPERHETERODYNE RECEIVERS
Efficiency of coherent reception of optical signal propagating through turbulent atmosphere N86-15472
SUPERNOVAE
Stellar core collapse and supernova
[DE85-017398] N86-16172
Theoretical models for Type 1 and Type 2 supernova
[DE85-016288] N86-16174
SUPERSONIC AIRCRAFT
Investigation of a supersonic cruise fighter model flow field
[NASA-TM-86361] N86-15248
SUPERSONIC COMBUSTION
Study of high speed combustion flows by laser velocimetry
[NASA-CR-176439] N86-15668
SUPERSONIC COMBUSTION RAMJET ENGINES
Scramjet sidewall burning: Preliminary shock tunnel results
[NASA-CR-176420] N86-15337
SUPERSONIC FLIGHT
Damping of the rolling motion of full caliber fin-stabilized projectiles in supersonic flight
[ISL-CO-233/84] N86-15253
SUPERSONIC FLOW
Objectives and scope of the Working Group 07 N86-15257
Exact solutions to transonic and supersonic flows N86-15260
Numerical simulation of viscous supersonic flow over a generic fighter configuration
[NASA-TM-86823] N86-15627
SUPPORT SYSTEMS
Considerations for the design and implementation of a management support system for the Electronic Warfare System Support Laboratory
[AD-A158978] N86-15325
The airlift dilemma: An update
[AD-A159307] N86-15353
SURFACE ACOUSTIC WAVE DEVICES
Nonsinusoidal modes of oscillator with multifrequency surface-acoustic-wave resonator N86-15488
Degradation of surface-acoustic-wave resonators N86-15573
The Surface Acoustic Wave (SAW) chemisensor. Part 1: A literature review
[PML-1985-3-PT-1] N86-15649
SURFACE DEFECTS
A cascade diffusion theory of sink capture fluctuations during irradiation of a solid
[ORNL-6123] N86-15356
SURFACE FINISHING
Thermally, chemically resistant enamels N86-15409
Characteristics of electrophysical and photoelectric properties of MOS-structures on indium arsenide N86-15486
SURFACE LAYERS
Novel approaches to passivation of Si for VHSIC - based on fundamental studies
[AD-A158238] N86-15546
Effects of waves on the boundary layer of a surface-piercing body
[AD-A158053] N86-15633
SURFACE NAVIGATION
An operational wave model for the North Atlantic Ocean
[KNMI-WR-85-3] N86-15857
SURFACE PROPERTIES
Textured carbon on copper: A novel surface with extremely low secondary electron emission characteristics
[NASA-TP-2543] N86-15394
Surface passivation of semiconductor circuit elements with layer of wideband semiconductor N86-15485
Predicting and diagnosing performance of transistors, integrated circuits and large-scale-integration systems by multilevel simulation methods and programs N86-15487
SURFACE ROUGHNESS
Programming a multiple-orifice hydraulic decelerator
[AD-A159428] N86-15328
Description, analysis, and prediction of sea-floor roughness using spectral models
[AD-A158000] N86-15846
The experimental investigation of the inverse problem in rough surface scattering of acoustic waves
[AD-A158070] N86-16044
SURFACE TEMPERATURE
Catalytic surface effects on contaminated space shuttle tile in a dissociated nitrogen stream
[NASA-TM-86770] N86-15335
A numerical study on the response of the tropical Pacific sea surface temperature to a sudden change of wind stress N86-15698
A numerical modelling of the seasonal variation of the tropical Pacific sea surface temperature N86-15699
SURFACE TO SURFACE ROCKETS
Human factors engineering design criteria for future systems. Report number 3: Design criteria evolving from the Multiple Multiple Rocket System (MLRS) operational test 3
[AD-A158316] N86-15916
SURFACE WATER
Water resources data for California, water year 1983. Volume 3: Southern Central Valley Basins and the Great Basin from Walker River to Truckee River
[PB85-232312] N86-15720
Water resources data for Washington, water year 1982. Volume 2: Eastern Washington
[PB85-236834] N86-15721
SURFACE WAVES
A numerical model of the turbulent boundary layer beneath surface waves and tides
[IOS-196] N86-15854
Thin superconducting film characterization by surface acoustic waves
[AD-A158311] N86-16127
SURFACES
Hydrodynamic noise and surface compliance--an overview of the Naval Underwater Systems Center IR/IED program
[AD-A157799] N86-15630
SURGES
Analysis of transients in direct current cable insulation N86-15468
SWEDEN
The seismicity of southern Sweden, 1979 - 1984
[FOA-C-20572-TI] N86-15765
SWEEP FREQUENCY
The parameters of adiabatic rapid passage in the 0-0 hyperfine transition of Rb-87
[AD-A158562] N86-16056
SWEPT WINGS
Numerical solutions for three-dimensional cases: Swept wings N86-15263
SWIMMING
One aspect of crew training N86-15885
SWITCHES
Improved lifetime high voltage switch electrode
[AD-A158961] N86-15554
Variable radix processor
[AD-D011893] N86-15918
SWITCHING
Picosecond photoconductivity of indium aresenide N86-15596
Specific recommendations for improving network feedback to hosts
[AD-A158768] N86-15924
SWITCHING CIRCUITS
Fuji, Thomson to develop, produce high-powered transistors N86-15437
Experimental determination of turn-off time of high-voltage power thyristors N86-15602
SYMMETRY
Does one need a fourth generation of leptons
[PREPRINT-461] N86-16071
SYNCHRONISM
An algorithm for active adaptive control of periodic interference
[AD-A156651] N86-16052
SYNOPTIC METEOROLOGY
Satellite microwave observations of a storm complex: A comparative analysis
[NASA-CR-176430] N86-15822
White light solar corona: An atlas of 1984 K-coronameter synoptic charts, December 1983 - January 1985
[PB85-191021] N86-16180
SYNTAX
The design and analysis of a stylized natural grammar for an object-oriented language (OMEGA)
[AD-A159434] N86-15964
SYNTHESIS (CHEMISTRY)
United States Air Force Academy, Department of Chemistry Research: AY 1983-1984
[AD-A159319] N86-15343
SYNTHETIC APERTURE RADAR
Venus-15, Venus-16 synthetic aperture radar on Venus satellite orbit N86-15510
SAR (Synthetic Aperture Radar) data collection and processing summary - 1984 SARSEX (SAR internal wave signature experiment) experiment
[AD-A159440] N86-15530

Basic characteristics of radar antenna with synthesized aperture tracking arbitrary motion of aircraft N86-15575

SYNTHETIC RESINS
Calculating the vulnerability of synthetic polymers to autoignition during nuclear flash
[AD-A159420] N86-15399

SYSTEM EFFECTIVENESS
Acoustical imaging system evaluation
[AD-A159425] N86-15684
Human factors engineering design criteria for future systems. Report number 3: Design criteria evolving from the Multiple Multiple Rocket System (MLRS) operational test 3
[AD-A158316] N86-15916
Field test of the methodology for generating efficiency and effectiveness measures
[AD-A158183] N86-16149

SYSTEM FAILURES
Procedures and general method for checking microprocessor malfunctions on the basis of pseudorandom testing sequences N86-15929

SYSTEM IDENTIFICATION
Introduction to nonlinear systems analysis and identification
[RR-277] N86-16029

SYSTEMS ANALYSIS
Restructuring the rotor analysis program C-60 N86-15292
Acoustical imaging system evaluation
[AD-A159425] N86-15684
Analysis of a direct radiation solar dehumidification system
[DE85-008820] N86-15736
A design evaluation checklist for user-system interface software
[AD-A158599] N86-15954
An interactive discrete controls analysis option (ORACLS) for the CONTROLS analysis package on the IBM 3033
[AD-A158754] N86-15956
A computer program for analyzing loglinear models with latent variables: LCAG N86-16026
Research in applied mathematics related to nonlinear system theory
[AD-A158330] N86-16027
Introduction to nonlinear systems analysis and identification
[RR-277] N86-16029
Queueing network systems with unbalanced flows and their applications to performance evaluation of highly parallel distributed information systems: Revision
[AD-A158052] N86-16154

SYSTEMS COMPATIBILITY
Multiprocessor systems with dynamic redistribution of requests through a common bus N86-15933

SYSTEMS ENGINEERING
System engineering and energy cost analysis of small and medium wind turbines
[DE85-012159] N86-15738
Managing computer systems development: Understanding the human and technological imperatives
[AD-A158976] N86-15917
Programming productivity enhancement by the use of application generators by the use of application generators
[AD-A158590] N86-15953
A design evaluation checklist for user-system interface software
[AD-A158599] N86-15954

T

TABLES (DATA)
Space activities of the United States, Soviet Union and other launching countries/organizations, 1957-1984
[GPO-46-504] N86-15330
Tables of masses, binding energies, half-lives and natural abundances
[DE85-016344] N86-16061

TACTICS
Acoustical imaging system evaluation
[AD-A159425] N86-15684

TARGET RECOGNITION
Time characteristics of scattering by radar targets N86-15512

TARGET SIMULATORS
A target tracker using a Doppler compensated correlation technique
[AD-A158087] N86-15990

TARGETS
Number of targets threatened simultaneously (NOTTS) in conjunction with over the horizon back-scatter (OTHB) radar coverage
[AD-A159304] N86-15528
Steady state penetration of rigid perfectly plastic targets
[AD-A158081] N86-15670
Estimation of the trajectory parameters of an accelerationless target from angle measurements of a single, stationary, acoustic sensor. Error sources and their influence
[REPT-12-84] N86-16039

TAYLOR INSTABILITY
Taylor-Goertler instabilities of Tollmien-Schlichting waves and other flows governed by the interactive boundary layer equations
[NASA-CR-178010] N86-15628
Instability of time-periodic flows
[NASA-CR-178009] N86-15629
On the growth rate of Rayleigh-Taylor instability at the decelerating shock front N86-16112

TECHNOLOGY ASSESSMENT
Study of high speed combustion flows by laser velocimetry
[NASA-CR-176439] N86-15668

TECHNOLOGY TRANSFER
East Europe report: Science and technology
[JPRS-ESA-85-031] N86-15893
The role of technical information in US competitiveness with Japan
[GPO-51-564] N86-16152

TECHNOLOGY UTILIZATION
Call to expand information network for basic research N86-15475
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-006] N86-15561
Microwave radiometers for remote sensing applications
[REPT-S-157] N86-15716
Image registration N86-15718

TECTONICS
Structure and tectonics of the Long Island platform N86-15752

TELECOMMUNICATION
Naval space surveillance modernized receiver system. Volume 6: Data communications subsystem
[AD-A158465] N86-15523
Integrated Services Digital Network (ISDN)
[AD-A159578] N86-15531
Computer security policies
[GPO-52-154] N86-15919

TELEMETRY
A proposed technique for the Venus balloon telemetry and Doppler frequency recovery
[NASA-CR-176448] N86-15333

TELEPHONES
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-009] N86-15452

TELEVISION CAMERAS
Color-encoding raster light filters for single-tube color television cameras N86-15580
Improvement of color reproduction by television cameras N86-15581

TELEVISION EQUIPMENT
Digital methods of recording color television images on film tape N86-15579

TELEVISION RECEPTION
Transmission of television signals over optical communication channel by means of frequency modulation N86-15495

TELEVISION TRANSMISSION
Transmission of television signals over optical communication channel by means of frequency modulation N86-15495
Improvement of color reproduction by television cameras N86-15581

TEMPERATURE CONTROL
Influence of embedded electrical fields on temperature stability of parameters of I-Ga-As heterophotoelements N86-15615

TEMPERATURE DEPENDENCE
Evaluating structural changes in jet fuels by electrical conductivity and viscosity N86-15345
Simultaneous incremental strain/incremental temperature analog device for, and method, of testing for stress response
[AD-D011912] N86-15411
Athermal conditions of optical elements and properties of optical materials N86-15423
Properties of optical filters on CdSe-HgSe base N86-15506
Raising the reliability of a remote processing system N86-15928

TEMPERATURE DISTRIBUTION
User's manual for Massachusetts Institute of Technology Solar Thermal Pond Program (MITSOL)
[DE85-012147] N86-15733

TEMPERATURE EFFECTS
Analysis of the effects of transient heat transfer on axial flow compressor blade boundary layers
[AD-A158094] N86-15315
Scientists cite uses of cryogenics, low temperature measurement N86-15477
Investigation of reverse branch of voltage-current curve of GaAs high-voltage p-n structure N86-15614
Plasma heating effects during laser welding
[DE85-010776] N86-16119

TEMPERATURE GRADIENTS
Athermal conditions of optical elements and properties of optical materials N86-15423
Reducing dynamic errors of integrated-circuit CMOS switches N86-15492
Airborne Doppler measurements of the central California extended sea breeze N86-15791

TEMPERATURE MEASUREMENT
Scientists cite uses of cryogenics, low temperature measurement N86-15477
Time-resolved flowfield measurements in a turbine stage
[AD-A158092] N86-15634
Spectroscopic temperature measurements in interior ballistic environments
[ISL-CO-235/84] N86-15641
Research on the crystal growth and dielectric properties of high permittivity ferroelectric materials
[AD-A157820] N86-16126

TEMPERATURE PROFILES
Time-resolved flowfield measurements in a turbine stage
[AD-A158092] N86-15634
Mizlant 84 data report results of an oceanographic cruise to the Greenland Sea, August-September 1984
[AD-A157997] N86-15845

TEMPORAL DISTRIBUTION
A synoptic and mesoscale study of a frequent lightning event
[AD-A158225] N86-15825
Temporal and spatial distributions of Arctic Sea ice thickness and pressure ridging statistics
[AD-A159577] N86-15849
Time-resolved measurement of energy and species of an intense pulsed ion beam N86-16104

TEMPORAL RESOLUTION
Time characteristics of scattering by radar targets N86-15512

TENSILE PROPERTIES
Microstructural control to improve the properties of chromium-molybdenum weld metal
[DE85-016179] N86-15390

TENSILE STRENGTH
Mechanical properties testing of candidate polymer matrix materials for use in high performance composites
[NASA-CR-177970] N86-15349

TENSILE STRESS
Effects of vibration-induced cavitation of physicochemical characteristics of aircraft fuel N86-15346

TENSORS
Seismic moment tensor recovery at low frequencies N86-15750
Relation between the supertableaux of the supergroups orthosymplectic OSP (2 2) and superunity SU (1 2)
[PREPRINT-459] N86-16031

TERRESTRIAL RADIATION
The use of satellite data in understanding and predicting convective and large-scale dynamical processes N86-15776

TEST FACILITIES
Performance and loads data from a hover test of a full-scale XV-15 rotor
[NASA-TM-86833] N86-15243

TEST STANDS
An analysis of cross-coupling of a multicomponent jet engine test stand using finite element modeling techniques
[NASA-CR-176424] N86-15323

TETHERING
Space station propulsion requirements study
[NASA-CR-174934] N86-15339

TEXTS
Logical and physical database design with a full-text environment
[DE85-015683] N86-16159

TEXTURES
Textured carbon on copper: A novel surface with extremely low secondary electron emission characteristics
[NASA-TP-2543] N86-15394

THEMATIC MAPPING
LANDSAT TM image data quality analysis for energy-related applications
[E86-10009] N86-15703

Peat landforms along the Albany River, northern Ontario. An ecological study of peat landforms in Canada and Alaska
[E86-10014] N86-15704
Evaluation of spatial, radiometric and spectral Thematic Mapper performance for coastal studies
[E86-10016] N86-15706
A comparison of LANDSAT TM to MSS imagery for detecting submerged aquatic vegetation in lower Chesapeake Bay N86-15707
Remote reconnaissance of submerged aquatic vegetation: A radiative transfer approach N86-15708
Remote sensing of coastal wetlands biomass using Thematic Mapper wavebands N86-15709
LANDSAT-4 Thematic Mapper Modulation Transfer Function (MTF) evaluation
[E86-10017] N86-15710
Systematic and random variations in digital Thematic Mapper data
[E86-10018] N86-15711

THEORETICAL PHYSICS
ANL/Star Project: A new architecture for large scale theoretical physics computations
[DE85-014988] N86-16144

THERMAL CYCLING TESTS
Thermal-mechanical fatigue test apparatus for metal matrix composites and joint attachments
[NASA-TM-87187] N86-15378

THERMAL DIFFUSIVITY
Chemoviscosity modeling for thermosetting resins
[NASA-CR-176409] N86-15395

THERMAL EXPANSION
Mechanical properties testing of candidate polymer matrix materials for use in high performance composites
[NASA-CR-177970] N86-15349

THERMAL INSULATION
Catalytic surface effects on contaminated space shuttle tile in a dissociated nitrogen stream
[NASA-TM-86770] N86-15335

THERMAL RESISTANCE
Thermally, chemically resistant enamels N86-15409
Condensation potential in high thermal performance walls. Hot, humid summer climate
[AD-A158002] N86-15431

THERMAL STABILITY
Critical analysis of nitramine decomposition data: Product distributions from HMX and RDX decomposition
[AD-A159325] N86-15368

THERMAL STRESSES
Simultaneous incremental strain/incremental temperature analog device for, and method, of testing for stress response
[AD-D011912] N86-15411

THERMISTORS
Towed thermistor chain observations during MILDEX (Mixed Layer Dynamics Experiment)
[AD-A158304] N86-15847

THERMOCOUPLES
Dynamic gas temperature measurement system. Volume 2: Operation and program manual
[NASA-CR-168267] N86-15651

THERMODYNAMIC PROPERTIES
Moldable electrically conductive polymer compositions
[AD-D011887] N86-15402
Athermal conditions of optical elements and properties of optical materials N86-15423
Design of foundations in permafrost
[AD-A158063] N86-15433

THERMODYNAMICS
Thermal-mechanical fatigue test apparatus for metal matrix composites and joint attachments
[NASA-TM-87187] N86-15378
A theoretical investigation of acoustic cavitation
[AD-A158058] N86-16042
A computer simulation of the turbocharged turbo compounded diesel engine system: A description of the thermodynamic and heat transfer models
[NASA-CR-174971] N86-16164

THERMONUCLEAR EXPLOSIONS
Theoretical models for Type 1 and Type 2 supernova
[DE85-016288] N86-16174

THERMOREGULATION
Human thermoregulatory responses to cold air are altered by repeated cold water immersion
[AD-A158871] N86-15904

THERMOSETTING RESINS
Chemoviscosity modeling for thermosetting resins
[NASA-CR-176409] N86-15395

THERMOSPHERE
Auroral thermosphere temperatures from observations of 6300 A emissions
[NASA-TM-86530] N86-15755

THICK FILMS
Completely consumed carbide (C3) - A new process for dielectric isolation
[AD-A158298] N86-15548

THICKNESS
Response of the mesoscale atmosphere to diabatic heating N86-15794

THIN FILMS
Predicting and diagnosing performance of transistors, integrated circuits and large-scale-integration systems by multilevel simulation methods and programs N86-15487
Thin-film bolometer power transduce electrodynamic analysis and experimental investigation N86-15609
Elastohydrodynamic studies using thin film transducers
[RP-666] N86-15648
Thin superconducting film characterization by surface acoustic waves
[AD-A158311] N86-16127

THREADS
Stress analysis on screw thread
[AD-A159347] N86-15693

THREAT EVALUATION
Effect of threat stress on psychomotor stability of pilots differing in anxiety level N86-15869

THREE DIMENSIONAL BOUNDARY LAYER
Effects of waves on the boundary layer of a surface-piercing body
[AD-A158053] N86-15633

THREE DIMENSIONAL FLOW
Reference test cases and contributors N86-15261
Numerical solutions for three-dimensional cases: Swept wings N86-15263
Numerical solutions for three-dimensional cases: Delta wings N86-15264
Recent developments in three-dimensional wake analysis N86-15273
Multi-dimensional combustion instability analysis of solid propellant rocket motors
[AD-A158314] N86-15414
Numerical simulation of viscous supersonic flow over a generic fighter configuration
[NASA-TM-86823] N86-15627
Residues of integrals with three-dimensional multipole singularities, with application to the Lagally theorem
[AD-A158771] N86-15995

THREE DIMENSIONAL MOTION
Binocular image flows: Steps toward stereo - motion fusion
[AD-A158089] N86-15901

THRUST VECTOR CONTROL
Three-axis electrofluidic angular rate sensor for ejection seat steering thrust vector control
[AD-A159413] N86-15277
An analysis of cross-coupling of a multicomponent jet engine test stand using finite element modeling techniques
[NASA-CR-176424] N86-15323

THUNDERSTORMS
Mobile intercept of storms N86-15771
Deep convection in mesoscale convective systems N86-15782
Optical characteristics of lightning and thunderstorm currents N86-15788
Severe storm detection with passive 37 Ghz observations N86-15797
Investigations of severe/tornadic thunderstorm development and evolution based on satellite and AVE/SESAME/VAS data N86-15809
Detection of rotating thunderstorms using satellite imagery N86-15810
Satellite microwave observations of a storm complex: A comparative analysis
[NASA-CR-176430] N86-15822
A conceptual model of the severe-storm environment for inclusion into Air Weather Service severe-storm analysis and forecast procedures
[AD-A158010] N86-15824
A synoptic and mesoscale study of a frequent lightning event
[AD-A158225] N86-15825

THYRISTORS
Two-step pulse triggering of dynistor power switches N86-15601
Experimental determination of turn-off time of high-voltage power thyristors N86-15602

TIBET
Remote sensing of severe convective storms N86-15800

TIDES
A numerical model of the turbulent boundary layer beneath surface waves and tides
[IOS-196] N86-15854
The effect of the wind in the Eemsmond (the Netherlands, West Germany) on high tide levels in Delfzijl (the Netherlands)
[KNMI-TR-63] N86-15858

TILES
Catalytic surface effects on contaminated space shuttle tile in a dissociated nitrogen stream
[NASA-TM-86770] N86-15335

TIME
Silicon compiler design of combinational and pipeline adder integrated circuits
[AD-A158995] N86-15555

TIME CONSTANT
Wave and surf forecast model evaluation for use on a micro computer
[AD-A159063] N86-15848

TIME DEPENDENCE
On the assignment algorithm by means of multi-linked data structure N86-15426
A new approach to signal registration with the emphasis on variable time delay estimation N86-15514
Airborne atmospheric electricity experiments N86-15790
Problem solving under time-constraints
[AD-A158921] N86-15957

TIME FUNCTIONS
Time composite sounding N86-15808

TIME LAG
Control system design for cryogenic wind tunnel by performance vector performance
[DFVLR-FB-85-37] N86-15329
A new approach to signal registration with the emphasis on variable time delay estimation N86-15514
Balancing of a rod using a digitally controlled robot
[DFVLR-FB-85-41] N86-15677
Control and identification of time varying systems
[AD-A159067] N86-15999

TIME MEASUREMENT
Ultrasonic transit time measurements using fast analog to digital conversion and a fast fourier transform based algorithm
[AD-A159426] N86-16049

TIME OF FLIGHT SPECTROMETERS
Improving neutron reaction data through linac-based flight-time spectrometry
[DE85-016417] N86-16062

TIME OPTIMAL CONTROL
Control system design for cryogenic wind tunnel by performance vector performance
[DFVLR-FB-85-37] N86-15329

TIME SERIES ANALYSIS
A target tracker using a Doppler compensated correlation technique
[AD-A158087] N86-15990
A graphical similarity measure for time series models
[AD-A158869] N86-15996
Merits and demerits of the Maximum Entropy Spectral Analysis (MESA) method
[INPE-3590-PRE/787] N86-16012

TIMING DEVICES
Accelerator timing system
[LINO-109] N86-15560

TIP SPEED
Fundamental study of flow field generated by rotorcraft blades using wide-field shadowgraph
[NASA-CR-176443] N86-15249

TISSUES (BIOLOGY)
Intensity of lipid peroxidation in hypokinetic rat tissues N86-15876

TITANIUM ALLOYS
Fracture toughness testing of laser welds in 2 mm thick titanium alloy IMI 550
[REPT-3784/1/85] N86-15685

TITANIUM NITRIDES
TiN hard coating by reactive ion-plating
[BLL-RISLEY-TR-5112-(9091.9F)] N86-15371

TOKAMAK DEVICES
Large aspect ratio, high-beta tokamak fusion reactor
[DE85-016654] N86-16122

TOLERANCES (PHYSIOLOGY)
Man's tolerance to fulminant form of hypoxic hypoxia N86-15879
Investigation of catecholamine metabolism at high altitudes N86-15880
Can aircraft noise less than or equal 115 to dBA adversely affect reproductive outcome in USAF women?
[AD-A158322] N86-16045

TOLLMEIN-SCHLICHTING WAVES
F-111 natural laminar flow glove flight test data analysis and boundary layer stability analysis
[NASA-CR-166051] N86-15305
Taylor-Goertler instabilities of Tollmien-Schlichting waves and other flows governed by the interactive boundary layer equations
[NASA-CR-178010] N86-15628

TOPOGRAPHY
Dynamics and structure of Gulf Stream meanders northeast of Cape Hatteras, N.C. N86-15841

Description, analysis, and prediction of sea-floor roughness using spectral models
[AD-A158000] N86-15846

TOPOLOGY
Red-graphic editor in printed circuit board design system N86-15942

TORNADOES
Investigations of severe/tornadic thunderstorm development and evolution based on satellite and AVE/SESAME/VAS data N86-15809
Detection of rotating thunderstorms using satellite imagery N86-15810

TOROIDAL PLASMAS
Magnetohydrodynamic stability of sphereomak plasma in toroidal flux conserver with rectangular cross section. Part 2: Application of Mercier criterion
[IPPJ-743] N86-16114

TOROIDS
Magnetic insulation in an ion diode with toroidal magnetic field N86-16099

TORSION
The influence of dynamic inflow and torsional flexibility on rotor damping in forward flight from symbolically generated equations N86-15295
Flap-lag-torsion stability in forward flight N86-15296
Dynamic stability of a bearingless circulation control rotor blade in hover N86-15297

TORSIONAL STRESS
Development of an unsteady aerodynamics model to improve correlation of computed blade stresses with test data N86-15288
Aeroelastic considerations for torsionally soft rotors N86-15289
Deformation behavior of anisotropic sand during principal stress axes rotation N86-15421

TORSIONAL VIBRATION
Experimentally determined flutter from two- and three-bladed model bearingless rotors in hover N86-15286

TOUGHNESS
Mechanical properties testing of candidate polymer matrix materials for use in high performance composites
[NASA-CR-177970] N86-15349

TOWED BODIES
Towed thermistor chain observations during MILDEX (Mixed Layer Dynamics Experiment)
[AD-A158304] N86-15847

TOXIC HAZARDS
Migration of hazardous substances through soil. Part 2: Determination of the leachability of metals from five industrial wastes and their movement within soil
[AD-A158990] N86-15740
Topical hazard evaluation program of Candidate Insect repellent AI3-35770 Hexahydro-1-((2-Methylcyclohexyl) Carbonyl)-1-H-Azepine
[AD-A158386] N86-15903

TOXICITY
Migration of hazardous substances through soil. Part 2: Determination of the leachability of metals from five industrial wastes and their movement within soil
[AD-A158990] N86-15740

TOXICITY AND SAFETY HAZARD
Migration of hazardous substances through soil. Part 2: Determination of the leachability of metals from five industrial wastes and their movement within soil
[AD-A158990] N86-15740

TOXICOLOGY
USSR report: Chemistry
[JPRS-UCH-85-013] N86-15344

TOXINS AND ANTITOXINS
Ultrasensitive detection of chemical substances
[AD-A158224] N86-15363

TRACE ELEMENTS
Capabilities, needs and applications of gaseous tracers
[DE85-015194] N86-15743
Teh carbon dioxide system and its role on trace metal chemistry in the marine environment N86-15843

TRACKING RADAR
Basic characteristics of radar antenna with synthesized aperture tracking arbitrary motion of aircraft N86-15575

TRADEOFFS
Light helicopter family trade-off analysis. Volume 4: Appendix N
[AD-A158075] N86-15306
Light helicopter family trade-off analysis. Volume 7: Appendix R
[AD-A158076] N86-15307
Light helicopter family trade-off analysis. Volume 8: Appendices S and T
[AD-A158077] N86-15308
Light helicopter family trade-off analysis. Volume 10: Appendices V, W, X, and Z
[AD-A158079] N86-15309
Lightning mapper and the future N86-15786

TRAILING EDGE FLAPS
Reference test cases and contributors N86-15261

TRAILING EDGES
Vortices and pressure waves at trailing edges
[ISL-CO-224/84] N86-15252

TRAINING EVALUATION
Experience and performance in video games and its influence on aptitude tests in aviation psychology
[DFVLR-FB-85-43] N86-15915

TRAJECTORIES
An optimisation method for reconstruction of flight path trajectories from non-synchronous time-sampled observations by two cine cameras
[ARL-SYS-R-34] N86-15279

TRAJECTORY MEASUREMENT
Estimation of the trajectory parameters of an accelerationless target from angle measurements of a single, stationary, acoustic sensor. Error sources and their influence
[REPT-12-84] N86-16039

TRANSDUCERS
Noise characteristics of stroboscopic transducers built with GaAs microcircuit integration N86-15489
Thin-film bolometer power transduce electrodynamic analysis and experimental investigation N86-15609

TRANSFER FUNCTIONS
Energy function and conductivity of metal-polymer composites N86-15347

TRANSFORMATIONS (MATHEMATICS)
Residues of integrals with three-dimensional multipole singularities, with application to the Lagally theorem
[AD-A158771] N86-15995
Control and identification of time varying systems
[AD-A159067] N86-15999

TRANSISTOR LOGIC
Methodology for determining dynamic characteristics of tristable-logic integrated circuits N86-15491

TRANSISTORS
Fuji, Thomson to develop, produce high-powered transistors N86-15437
Predicting and diagnosing performance of transistors, integrated circuits and large-scale-integration systems by multilevel simulation methods and programs N86-15487

TRANSIT TIME
Ultrasonic transit time measurements using fast analog to digital conversion and a fast fourier transform based algorithm
[AD-A159426] N86-16049

TRANSITION METALS
Preparation and properties of transition metal beta aluminas
[AD-A159408] N86-16130

TRANSITION POINTS
Test for a possible melting transition in grain boundaries in aluminum near the melting point
[DE85-013238] N86-15387

TRANSITION PROBABILITIES
Metal-insulator transition and Landau Fermi liquid theory
[NOTA-INTERNA-844] N86-16142

TRANSITION TEMPERATURE
Thin superconducting film characterization by surface acoustic waves
[AD-A158311] N86-16127

TRANSMISSION
Evaluation of a load cell model for dynamic calibration of the rotor systems research aircraft N86-15304

TRANSMISSION LINES
Multilayer volume microwave filters N86-15465
Analysis of transients in direct current cable insulation N86-15468
Effect of antenna impedance mismatch on the signal-to-noise ratio of a radio receiving system
[AD-A159070] N86-15525
Pulse power transport to REB diode through slender MITL N86-16100
PBFA-2 vacuum system design using a lumped parameter computer model
[DE85-013117] N86-16125

TRANSMISSION LOSS
Radiation pattern and reduced gain of linear antenna in turbulent anisotropic atmosphere N86-15464

TRANSMITTANCE
Influence of roughness of ends of fiber optic plates on modulation transfer coefficient N86-15508

TRANSONIC FLOW
A consistent spatial differencing scheme for the transonic full-potential equation in three dimensions
[NASA-TM-86716] N86-15246
Separated transonic airfoil flow calculations with a nonequilibrium turbulence model
[NASA-TM-86830] N86-15247
Investigation of a supersonic cruise fighter model flow field
[NASA-TM-86361] N86-15248
Early transonic ideas in the light of later developments
[AD-A159101] N86-15250
Objectives and scope of the Working Group 07 N86-15257
Exact solutions to transonic and supersonic flows N86-15260
Time-resolved flowfield measurements in a turbine stage
[AD-A158092] N86-15634

TRANSONIC SPEED
Transonic drag rise and drag reduction by active/passive boundary layer control N86-15275

TRANSONIC WIND TUNNELS
Early transonic ideas in the light of later developments
[AD-A159101] N86-15250

TRANSPARENCE
Athermal conditions of optical elements and properties of optical materials N86-15423

TRANSPORT AIRCRAFT
Design considerations for application of laminar flow control systems to transport aircraft N86-15270
Prediction of wing aeroelastic effects on aircraft lift and pitching moment characteristics
[NASA-TM-87631] N86-15319
French program CHARME develops propfan aircraft N86-15450
Adapter pallet system
[AD-D011858] N86-15671

TRANSPORT PROPERTIES
Extension of electronic transport properties of polymer dielectrics to severe environments encountered in systems
[DE85-017321] N86-15406
Approach to uncertainty assessment for fluid flow and contaminant transport modeling in heterogeneous groundwater systems
[DE85-016621] N86-15714
Transportable charge in a periodic alternating gradient system
[DE85-015664] N86-16085
Proceedings of Collaborating Research Meeting on Development and Applications of High-Power Particle Beams
[IPPJ-742] N86-16096
Pulse power transport to REB diode through slender MITL N86-16100

TRANSPORT THEORY
Submicron phonics 1
[AD-A159421] N86-16131

TRANSPORTATION
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-006] N86-15561

TRANSVERSE WAVES
Finite-difference electrodynamic analysis of a tapering coaxial waveguide incorporating a dielectric wedge-shaped lens for concentrating Transverse Electromagnetic (TEM) waves
[SAND-84-2062] N86-15517

TRAPPED VORTEXES
Observations of equatorially trapped waves in the eastern Atlantic Ocean from inverted echo sounders N86-15840

TRAVELING WAVE TUBES
Textured carbon on copper: A novel surface with extremely low secondary electron emission characteristics
[NASA-TP-2543] N86-15394

TRIANGULATION
An optimisation method for reconstruction of flight path trajectories from non-synchronous time-sampled observations by two cine cameras
[ARL-SYS-R-34] N86-15279

TRIGGER CIRCUITS
Two-step pulse triggering of dynistor power switches N86-15601

TRITIUM
Tritium ingestion in rats N86-15895

TROPICAL METEOROLOGY
Dynamics and energetics of the South Pacific Convergence Zone during FGGE SOP-1 N86-15779

TROPICAL REGIONS
A numerical modelling of the seasonal variation of the tropical Pacific sea surface temperature N86-15699

TROPOSPHERE
Analysis of Doppler lidar data N86-15792
Mesoscale ageostrophic circulations associated with baroclinic jet streaks N86-15795
Single station assessment of atmospheric boundary layer properties in the eastern Mediterranean Sea
[AD-A159432] N86-15827

TTL INTEGRATED CIRCUITS
Methodology for determining dynamic characteristics of tristable-logic integrated circuits N86-15491

TUNERS
Wavelength selective demultiplexer tuner
[AD-D011890] N86-15532

TUNGSTEN
Thermal-mechanical fatigue test apparatus for metal matrix composites and joint attachments
[NASA-TM-87187] N86-15378
TUNGSTEN ALLOYS
Research on the crystal growth and dielectric properties of high permittivity ferroelectric materials
[AD-A157820] N86-16126
TUNNELING (EXCAVATION)
Progress on combined load- and profile-control for horizontal-turret, single- and double-arm tunnelling machines
[RR-276] N86-15674
TURBINE BLADES
Time-resolved flowfield measurements in a turbine stage
[AD-A158092] N86-15634
TURBINE ENGINES
Review of the development of small- and medium-capacity gas turbines at the Motoren- und Turbinen Union
[NASA-TM-77942] N86-15314
TURBINES
Time-resolved flowfield measurements in a turbine stage
[AD-A158092] N86-15634
TURBOFAN ENGINES
Analysis of the effects of transient heat transfer on axial flow compressor blade boundary layers
[AD-A158094] N86-15315
TURBOFANS
On second propagation in radial fan casings
[DFVLR-FB-85-32] N86-16053
TURBOJET ENGINES
Fuel effects on soot formation in turbojet engines
[AD-A159073] N86-15416
TURBOMACHINERY
Small turbine technology review
[AD-A158514] N86-15316
TURBOPROP ENGINES
Review of the development of small- and medium-capacity gas turbines at the Motoren- und Turbinen Union
[NASA-TM-77942] N86-15314
TURBULENCE
Studies on the interference of wings and propeller slipstreams N86-15241
Separated transonic airfoil flow calculations with a nonequilibrium turbulence model
[NASA-TM-86830] N86-15247
Procedure for calculating attenuation in and reliability of atmospheric optical data transmission systems N86-15470
TURBULENT BOUNDARY LAYER
Boundary-layer transition: T-S waves and crossflow mechanisms N86-15268
Turbulent drag reduction for external flows N86-15271
Hydrodynamic noise and surface compliance--an overview of the Naval Underwater Systems Center IR/IED program
[AD-A157799] N86-15630
A numerical model of the turbulent boundary layer beneath surface waves and tides
[IOS-196] N86-15854
TURBULENT FLOW
Turbulent drag reduction for external flows N86-15271
F-111 natural laminar flow glove flight test data analysis and boundary layer stability analysis
[NASA-CR-166051] N86-15305
Analysis of the effects of transient heat transfer on axial flow compressor blade boundary layers
[AD-A158094] N86-15315
Multi-dimensional combustion instability analysis of solid propellant rocket motors
[AD-A158314] N86-15414
Numerical simulation of viscous supersonic flow over a generic fighter configuration
[NASA-TM-86823] N86-15627
TURBULENT WAKES
Recent developments in three-dimensional wake analysis N86-15273
TWILIGHT GLOW
The twilight sodium layer
[INPE-3568-PRE/773] N86-15754
TWO DIMENSIONAL BODIES
Mathematical theory of holographic memory N86-15946
TWO DIMENSIONAL FLOW
Reference test cases and contributors N86-15261
Numerical solutions of two-dimensional reference test cases N86-15262
Multi-dimensional combustion instability analysis of solid propellant rocket motors
[AD-A158314] N86-15414
TWO PHASE FLOW
Droplet size and evaporation rate within a two-phase flow by morphology-dependent resonances in the optical spectra
[AD-A158931] N86-16091
TYPEWRITERS
Raising the reliability of a remote processing system N86-15928

U

U.S.S.R.
Space activities of the United States, Soviet Union and other launching countries/organizations, 1957-1984
[GPO-46-504] N86-15330
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-009] N86-15452
ULLAGE
Wave motion analysis of a nonspinning liquid filled cylinder
[AD-A159324] N86-15636
ULTRAPURE METALS
Microelectronics technology N86-15930
ULTRASONIC RADIATION
Theoretical studies in nondestructive evaluation (NDE)
[AD-A159155] N86-15682
Ultrasonic transit time measurements using fast analog to digital conversion and a fast fourier transform based algorithm
[AD-A159426] N86-16049
ULTRASONIC TESTS
Nondestructive ultrasonic characterization of engineering materials
[NASA-CR-176349] N86-15680
ULTRASONIC WAVE TRANSDUCERS
Ultrasonic transit time measurements using fast analog to digital conversion and a fast fourier transform based algorithm
[AD-A159426] N86-16049
ULTRASONICS
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-006] N86-15561
Use of ultrasonics to determine the crack size in high strength steel gun barrels
[AD-A159405] N86-15683
Acoustical imaging system evaluation
[AD-A159425] N86-15684
Informativeness of echo signal in pulsed ultrasonography of the brain (with use of model) N86-15887
Ultrasonic measurement of particles in a viscous fluid
[AD-A158989] N86-16046
Ultrasonic characterization of porosity using the Kramers-Kronig relations
[DE85-017346] N86-16051
Thin superconducting film characterization by surface acoustic waves
[AD-A158311] N86-16127
ULTRAVIOLET LASERS
Subnanosecond short wavelength generation using optical fibers
[AD-A158769] N86-16090
ULTRAVIOLET RADIATION
Subnanosecond short wavelength generation using optical fibers
[AD-A158769] N86-16090
ULTRAVIOLET SPECTRA
Corrections to universal scaling for the 2D nonlinear sigma model on the lattice
[PREPRINT-460] N86-16145
UNDERGROUND EXPLOSIONS
Radionuclide Migration Project 1984
[DE85-017383] N86-16076
UNDERWATER ACOUSTICS
Experimental investigation of acoustic wave electrical excitation in electrolyte solution N86-15621
Underwater sound communication
[REPT-5-85] N86-16038
Optimum frequency for propagation of sound in shallow sound channels
[AD-A159064] N86-16047
The broadband normal mode model PROTEUS
[AD-A159091] N86-16048
Arctic Ocean background noise caused by ridging of sea ice
[AD-A159587] N86-16050
UNDERWATER COMMUNICATION
Underwater sound communication
[REPT-5-85] N86-16038
UNIFORM FLOW
Pseudoinverse restoration of blurred image in uniform motion N86-15483
UNITED STATES
Severe storm detection with passive 37 Ghz observations N86-15797
The role of technical information in US competitiveness with Japan
[GPO-51-564] N86-16152
UNIVERSITIES
Image registration N86-15718
UNIVERSITY PROGRAM
National Science Foundation authorization, 1986
[GPO-48-945] N86-16162
UPPER ATMOSPHERE
Micro-Raman spectroscopy: The analysis of micrometer and submicrometer atmospheric aerosols
[NASA-CR-177964] N86-15756
UPPER IONOSPHERE
Lower hybrid parametric processes on auroral field lines in the topside ionosphere
[UIO-SR-85-03] N86-15764
URANIUM 233
Mean fission neutron spectrum energies for (252) Cf and fissile nuclides, (233)U, (235)U, (239)Pu and (241)Pu
[DE85-013298] N86-16086
URANIUM 235
Mean fission neutron spectrum energies for (252) Cf and fissile nuclides, (233)U, (235)U, (239)Pu and (241)Pu
[DE85-013298] N86-16086
USER MANUALS (COMPUTER PROGRAMS)
Dynamic gas temperature measurement system. Volume 2: Operation and program manual
[NASA-CR-168267] N86-15651
User's manual for Massachusetts Institute of Technology Solar Thermal Pond Program (MITSOL)
[DE85-012147] N86-15733
Color post-processor for the EPIC-2 computer program
[AD-A159321] N86-15961
CAT: An interactive graphics code
[DE85-016212] N86-15967
EPIC/JANUS user's guide
[DE85-017027] N86-16158
USER REQUIREMENTS
A design evaluation checklist for user-system interface software
[AD-A158599] N86-15954

V

VACUUM CHAMBERS
Laser plus surface-dynamics facility
[AD-A158922] N86-15661
VACUUM SYSTEMS
Pulsed septum magnet for the Fermilab antiproton source
[DE85-016993] N86-16078
PBFA-2 vacuum system design using a lumped parameter computer model
[DE85-013117] N86-16125
VALUE
On the least favorable configuration of a selection procedure based on ranks
[AD-A159154] N86-16022
VANADIUM ALLOYS
Microstructural evaluation of 49Co-49Fe-2V alloy
[DE85-016500] N86-15388
VANES
Dynamic characteristics of air data sensor systems: Altimeter, speedometer and alpha times beta vane
[NAL-TR-852] N86-15312
VAPOR DEPOSITION
Fundamental studies and device development in beta silicon carbide
[AD-A159446] N86-16132
VAPOR PHASES
Variability of major organic components in aircraft fuels
[AD-A159057] N86-15415
VARIABILITY
Variability of major organic components in aircraft fuels
[AD-A159057] N86-15415
Improved satellite retrievals and mesoscale moisture variability N86-15812
VARIABLE STARS
Recurrent population 2 X-ray transients - similarities to SU UMa cataclysmic variables
[DE85-014075] N86-16184
VARIANCE (STATISTICS)
Variance component estimation method for sparse matrix applications
[PB85-234383] N86-16011
VARIATIONS
Airborne atmospheric electricity experiments N86-15790

VEGETATION
Biochemical processes in sagebrush ecosystems: Interactions with terrain
[E86-10015] N86-15705
VEGETATIVE INDEX
Peat landforms along the Albany River, northern Ontario. An ecological study of peat landforms in Canada and Alaska
[E86-10014] N86-15704
Remote sensing of coastal wetlands biomass using Thematic Mapper wavebands N86-15709
VEHICLE WHEELS
Investigation of the friction of Becorit 820 versus cast iron
[WB-83/TRI-10053] N86-15675
VELOCITY DISTRIBUTION
Quasi nonstretching hypervelocity jets
[ISL-CO-236/84] N86-15254
Research into heat transfer by convection in the chamber of a furnace with relation to the angle at which a high velocity jet strikes a plane surface
[BLLD-M-36478-(5828.4)] N86-15624
Properties of the internal wave field on the equator N86-15839
VELOCITY MEASUREMENT
Droplet sizing research
[AD-A158318] N86-15653
Study of high speed combustion flows by laser velocimetry
[NASA-CR-176439] N86-15668
VENERA SATELLITES
Venus-15, Venus-16 synthetic aperture radar on Venus satellite orbit N86-15510
VENUS (PLANET)
A proposed technique for the Venus balloon telemetry and Doppler frequency recovery
[NASA-CR-176448] N86-15333
VENUS SURFACE
Venus-15, Venus-16 synthetic aperture radar on Venus satellite orbit N86-15510
VERTICAL DISTRIBUTION
Analysis of Doppler lidar data N86-15792
Airborne Doppler lidar activities N86-15793
Response of the mesoscale atmosphere to diabatic heating N86-15794
VERY HIGH FREQUENCIES
Broadband simulation of multipath propagation in VHF mobile radio
[MBB-UA-905/85] N86-15540
VERY HIGH FREQUENCY RADIO EQUIPMENT
VHF-AM communications equipment selection and installation practices for helicopters
[DOT/FAA/PM-85/8] N86-15518
VERY LARGE SCALE INTEGRATION
VLSI (Very Large Scale Integrated) design of a sixteen bit pipelined multiplier using three micron NMOS technology
[AD-A159433] N86-15557
Representing time and space in an object oriented hardware description language
[AD-A158226] N86-15952
VERY LOW FREQUENCIES
Lower hybrid parametric processes on auroral field lines in the topside ionosphere
[UIO-SR-85-03] N86-15764
VIABILITY
On the effects of X irradiation on the Bacillus subtilis spores in a day and wet system
[DFVLR-FB-85-44] N86-15864
VIBRATION
Rotorcraft Dynamics 1984
[NASA-CP-2400] N86-15280
An examination of the relations between rotor vibratory loads and airframe vibrations N86-15299
Coupled rotor-body vibrations with inplane degrees of freedom N86-15301
Analysis of potential helicopter vibration reduction concepts N86-15302
Effects of vibration-induced cavitation of physicochemical characteristics of aircraft fuel N86-15346
VIBRATION DAMPING
Nonlinear dynamics of a helicopter model in ground resonance N86-15284
VIBRATION TESTS
Investigations of the relations between the damage evolution of vibrationally loaded samples and the measuring quantities of the instrumented accelerated fatigue test during the crackfree fatigue phase and microcrack formation phase N86-15694
VIBRATIONAL STRESS
Development of an unsteady aerodynamics model to improve correlation of computed blade stresses with test data N86-15288
VIBRATORY LOADS
Aeroelastic considerations for torsionally soft rotors N86-15289
VIDEO COMMUNICATION
Digital television routing systems: An introduction to integrated optical waveguide techniques and devices
[BBC-RD-1985/9] N86-15515
VIDEO EQUIPMENT
Raising the reliability of a remote processing system N86-15928
VIDEO SIGNALS
Digital television routing systems: An introduction to integrated optical waveguide techniques and devices
[BBC-RD-1985/9] N86-15515
VINYL POLYMERS
Demonstration of a pyroelectric conversion power cycle with a polymer
[AD-A158964] N86-15398
VIRGINIA
Revised Uniform Summary of Surface Weather Observations (RUSSWO). Parts A-F Fort Belvoir/Davison AAF, Virginia
[AD-A159609] N86-15834
VISCOELASTIC DAMPING
The Dowling wall pressure-spectrum analogy applied to an isotropic two-layered elastic medium
[AD-A158009] N86-15632
VISCOSITY
Chemoviscosity modeling for thermosetting resins
[NASA-CR-176409] N86-15395
VISCOUS DAMPING
The dynamic response of discretely damped structures under harmonic and random excitation
[R-475] N86-15686
VISCOUS DRAG
Aircraft drag reduction technology: A summary N86-15267
VISCOUS FLOW
Prediction of the drag of wings at subsonic speeds by viscous/inviscid interaction techniques N86-15274
Numerical simulation of viscous supersonic flow over a generic fighter configuration
[NASA-TM-86823] N86-15627
VISCOUS FLUIDS
Ultrasonic measurement of particles in a viscous fluid
[AD-A158989] N86-16046
VISIBILITY
Investigation of factors determining pilot's geocentric orientation N86-15868
VISIBLE SPECTRUM
The optical spectra of aerosols
[AD-A158057] N86-15758
VISUAL DISCRIMINATION
Enhancing visual sensitivity
[AD-A158799] N86-15906
Visual sensitivities and discriminations and their roles in aviation
[AD-A158962] N86-15907
VISUAL FLIGHT
Visual sensitivities and discriminations and their roles in aviation
[AD-A158962] N86-15907
VISUAL PERCEPTION
Visual display parameters
[AD-A158773] N86-15654
Investigation of factors determining pilot's geocentric orientation N86-15868
Computational models of human vision with applications
[NASA-CR-176413] N86-15898
Binocular image flows: Steps toward stereo - motion fusion
[AD-A158089] N86-15901
Enhancing visual sensitivity
[AD-A158799] N86-15906
Visual sensitivities and discriminations and their roles in aviation
[AD-A158962] N86-15907
VLASOV EQUATIONS
Analysis of microscopic instability for rotating LIB N86-16106
VOICE
Prosodic analysis by rule
[BR94770] N86-15516
VOICE COMMUNICATION
An examination of some error correcting techniques for continuous speech recognition technology
[AD-A158001] N86-15521
A variance detector for signal-gap discrimination in noisy speech channels
[AD-A159227] N86-15527
VOICE DATA PROCESSING
Prosodic analysis by rule
[BR94770] N86-15516
VOLATILITY
Collection and analysis of NASA clean room air samples
[NASA-CR-3947] N86-15358
VOLTAGE CONVERTERS (DC TO DC)
Principles and problems of building dc electric drives with symistor control N86-15598
Maximum attainable sensitivity of dc squids built with Josephson tunnel junctions N86-15619
VOLTAGE REGULATORS
Pulse-type voltage stabilizer with integral pulse-width modulation N86-15505
Investigation of reverse branch of voltage-current curve of GaAs high-voltage p-n structure N86-15614
VOLTERRA EQUATIONS
Analysis and identification of inertial devices N86-15594
VOLTMETERS
Investigation of reverse branch of voltage-current curve of GaAs high-voltage p-n structure N86-15614
VOLUMETRIC STRAIN
Simultaneous incremental strain/incremental temperature analog device for, and method, of testing for stress response
[AD-D011912] N86-15411
VORTEX SHEDDING
Vortices and pressure waves at trailing edges
[ISL-CO-224/84] N86-15252
VORTICES
Vortices and pressure waves at trailing edges
[ISL-CO-224/84] N86-15252
Taylor-Goertler instabilities of Tollmien-Schlichting waves and other flows governed by the interactive boundary layer equations
[NASA-CR-178010] N86-15628
Instability of time-periodic flows
[NASA-CR-178009] N86-15629
The effect of the Benthic Boundary Layer on the physics of intense mesoscale eddies N86-15751
Theoretical and experimental studies in support of the Geophysical Fluid Flow Experiment N86-15772
VORTICITY
Large-scale circulation anomalies and the predictability of northeast Brazil droughts
[INPE-3656-PRE/819] N86-15768
VULNERABILITY
Calculating the vulnerability of synthetic polymers to autoignition during nuclear flash
[AD-A159420] N86-15399
Significance of single particle effects in neutral beam weapon lethality
[DE85-012031] N86-16068

W

WAKES
Prediction of the drag of wings at subsonic speeds by viscous/inviscid interaction techniques N86-15274
WALKING MACHINES
An experimental study of an ultra-mobile vehicle for off-road transportation. Appendix 2. Dissertation. Kinematic optimal design of a six-legged walking machine
[AD-A159147] N86-15434
WALL FLOW
Scramjet sidewall burning: Preliminary shock tunnel results
[NASA-CR-176420] N86-15337
DFVLR develops new kind of walls or wind tunnel N86-15446
Hydrodynamic noise and surface compliance--an overview of the Naval Underwater Systems Center IR/IED program
[AD-A157799] N86-15630
WALL PRESSURE
The Dowling wall pressure-spectrum analogy applied to an isotropic two-layered elastic medium
[AD-A158009] N86-15632
WALLS
Condensation potential in high thermal performance walls. Hot, humid summer climate
[AD-A158002] N86-15431
The Dowling wall pressure-spectrum analogy applied to an isotropic two-layered elastic medium
[AD-A158009] N86-15632
WARFARE
The airlift dilemma: An update
[AD-A159307] N86-15353
WARNING SYSTEMS
Digital servocontroller system. Volume 2. Maintenance manual
[AD-A159066] N86-15322

WASHINGTON
Water resources data for Washington, water year 1982. Volume 2: Eastern Washington
[PB85-236834] N86-15721
WASTE DISPOSAL
Environmental considerations and waste planning on the lunar surface: An interactive qualifying N86-15331
Migration of hazardous substances through soil. Part 2: Determination of the leachability of metals from five industrial wastes and their movement within soil
[AD-A158990] N86-15740
A review of biological processes within oceanic water columns relevant to the assessment of the safety of disposal of waste, notably radioactive isotopes, on or within the seabed
[IOS-198] N86-15745
The permeability and consolidation of deep sea sediments
[IOS-201] N86-15855
WATER
Aircraft accident report: Vieques Air Link, Inc., Britten-Norman BN-21-6 Islander, N589SA, Vieques, Puerto Rico, August 2, 1984
[PB85-901408] N86-15276
Variability of major organic components in aircraft fuels
[AD-A159057] N86-15415
Formulas concerning nonelectrical properties of snow: The electrical engineer's point of view
[REPT-S-156] N86-15715
Mixing formulas and experimental results of the dielectric constant of snow
[REPT-S-158] N86-15717
Tritium ingestion in rats N86-15895
PETROS: A progam for calculating transport of heat, water, water vapor and air through a porous material
[DE85-013168] N86-15972
WATER DEPTH
A conservation law related to Kelvin's circulation theorem
[AD-A157819] N86-15631
Evolution of nonlinear wave groups on water of slowly-varying depth
[AD-A158860] N86-15635
The CTD data from the Northeast Atlantic 22 N-33 N, 19 W-24 W, July 1983. Discovery cruises 138, 139. --- conductivity, temperature, depth (CTD)
[IOS-188] N86-15850
CTD data from the Northeast Atlantic Ocean 40-48 N, 12-21 W collected on RRS DISCOVERY cruise 132 in February 1983 --- conductivity, temperature, depth (CTD)
[IOS-192] N86-15851
WATER HEATING
Monitoring of hot water plume movements in an aquifer with borehole/surface resistivity measurements
[DE85-014531] N86-15637
WATER IMMERSION
Effect of 7-day immersion hypokinesia on characteristics of precision movements N86-15874
Human thermoregulatory responses to cold air are altered by repeated cold water immersion
[AD-A158871] N86-15904
WATER LANDING
One aspect of crew training N86-15885
WATER MANAGEMENT
Water resources data for Ohio, water year 1984. Volume 2: St. Lawrence River Basin, statewide project data
[PB85-230233] N86-15719
WATER QUALITY
Water resources data for Ohio, water year 1984. Volume 2: St. Lawrence River Basin, statewide project data
[PB85-230233] N86-15719
Water resources data for California, water year 1983. Volume 3: Southern Central Valley Basins and the Great Basin from Walker River to Trucker River
[PB85-232312] N86-15720
Water resources data for Washington, water year 1982. Volume 2: Eastern Washington
[PB85-236834] N86-15721
WATER RESOURCES
Water resources data for Ohio, water year 1984. Volume 2: St. Lawrence River Basin, statewide project data
[PB85-230233] N86-15719
Water resources data for California, water year 1983. Volume 3: Southern Central Valley Basins and the Great Basin from Walker River to Trucker River
[PB85-232312] N86-15720
Water resources data for Washington, water year 1982. Volume 2: Eastern Washington
[PB85-236834] N86-15721
WATER RUNOFF
Water resources data for Ohio, water year 1984. Volume 2: St. Lawrence River Basin, statewide project data
[PB85-230233] N86-15719
WATER TEMPERATURE
Monitoring of hot water plume movements in an aquifer with borehole/surface resistivity measurements
[DE85-014531] N86-15637
WATER TREATMENT
Development of packed-tower air strippers for trichloroethylene removal at Wurtsmith Air Force Base, Michigan
[AD-A159139] N86-15326
WATER VAPOR
Statistical analysis and use of VAS radiance data N86-15811
Multispectral atmospheric mapping sensor of mesoscale water vapor features N86-15819
PETROS: A progam for calculating transport of heat, water, water vapor and air through a porous material
[DE85-013168] N86-15972
WATER WAVES
A conservation law related to Kelvin's circulation theorem
[AD-A157819] N86-15631
Evolution of nonlinear wave groups on water of slowly-varying depth
[AD-A158860] N86-15635
Wave and surf forecast model evaluation for use on a micro computer
[AD-A159063] N86-15848
A re-analysis of SWOP data --- Stereo Wave Observation Project (SWOP)
[IOS-195] N86-15853
A numerical model of the turbulent boundary layer beneath surface waves and tides
[IOS-196] N86-15854
An operational wave model for the North Atlantic Ocean
[KNMI-WR-85-3] N86-15857
WAVE AMPLIFICATION
Effectiveness of phase-conjugation systems in turbulent atmosphere N86-15513
WAVE DRAG
Numerical solutions for three-dimensional cases: Delta wings N86-15264
WAVE EQUATIONS
Analysis of elliptical waveguides in cylindrical reference basis N86-15612
Molecular processes in a high temperature shock layer
[NASA-CR-176357] N86-16054
WAVE EXCITATION
The Dowling wall pressure-spectrum analogy applied to an isotropic two-layered elastic medium
[AD-A158009] N86-15632
WAVE FRONTS
Investigation of hologram analyzer with single-component optical hologram matching system N86-15507
Effectiveness of phase-conjugation systems in turbulent atmosphere N86-15513
WAVE FUNCTIONS
Overlap of electron core states for very high compressions
[DE85-015745] N86-16138
WAVE INCIDENCE CONTROL
Effectiveness of phase-conjugation systems in turbulent atmosphere N86-15513
WAVE INTERACTION
Investigation of hologram analyzer with single-component optical hologram matching system N86-15507
WAVE PROPAGATION
Millimetric-wave antennas and devices: Review N86-15453
Boundary waves in finite antenna arrays N86-15455
Excitation of array of plane-parallel waveguides covered with dielectric layer of finite length N86-15459
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-006] N86-15561
Experimental study of magnetostatic wave propagation through film waveguides N86-15565
Modulation instability and solitons of electromagnetic wave envelopes in ferromagnetic semiconductors N86-15578
Stimulated emission of bounded strong-current electron beam with longitudinal magnetic field magnetostatic pumping N86-15591
Analysis of dislocation kinetics across shocks
[DE85-016444] N86-15638
The broadband normal mode model PROTEUS
[AD-A159091] N86-16048
Stimulated Raman scattering in the atmosphere and its implication for FELs
[DE85-016066] N86-16093
WAVE REFLECTION
Reflection coefficient of harrow grating with conductor strips with respect to electromagnetic waves N86-15577
WAVE SCATTERING
Scattering by cylinder with anisotropic impedance N86-15456
WAVEFORMS
A new approach to signal registration with the emphasis on variable time delay estimation N86-15514
Bipolar digitizer having compression capability
[AD-D011895] N86-15542
Input current shaped ac-to-dc converters
[NASA-CR-176438] N86-15544
WAVEGUIDE ANTENNAS
Millimetric-wave antennas and devices: Review N86-15453
Investigations and comparisons of new types of millimetre-wave planar arrays using microstrip and dielectric structures
[AD-A158313] N86-15522
WAVEGUIDE LASERS
Coupled high power waveguide laser research
[AD-A159079] N86-15662
WAVEGUIDES
Analysis of multimode waveguide-type power distributor N86-15458
Finite-difference electrodynamic analysis of a tapering coaxial waveguide incorporating a dielectric wedge-shaped lens for concentrating Transverse Electromagnetic (TEM) waves
[SAND-84-2062] N86-15517
Experimental study of magnetostatic wave propagation through film waveguides N86-15565
Adiabatic invariant value variation under shortwave band subcritical conditions N86-15572
Influence of higher types of oscillations on piston-tuned waveguide Gunn oscillator frequency N86-15611
Analysis of elliptical waveguides in cylindrical reference basis N86-15612
Subnanosecond short wavelength generation using optical fibers
[AD-A158769] N86-16090
WAVELENGTHS
Optimum frequency of communication channel for indoor radio telemetry N86-15493
Wavelength selective demultiplexer tuner
[AD-D011890] N86-15532
Wavelength error analysis in a multiple-beam Fizeau laser wavemeter having a linear diode array readout
[NASA-TM-87614] N86-16089
WEAPON SYSTEMS
Acoustical imaging system evaluation
[AD-A159425] N86-15684
WEATHER
Observational and theoretical studies of the evolving structure of baroclinic waves: Attractor dynamics of global weather systems N86-15781
Deep convection in mesoscale convective systems N86-15782
Kitzingen AI, Germany limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159604] N86-15829
AL Jubayl/Dhahran, Saudi Arabia limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159605] N86-15830
Dakar senegal limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159606] N86-15831
Tahiti Island Pacific limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159607] N86-15832
Pirmasens AHP DL, West Germany limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159608] N86-15833
Revised Uniform Summary of Surface Weather Observations (RUSSWO). Parts A-F Fort Belvoir/Davison AAF, Virginia
[AD-A159609] N86-15834
Yongsan Reservation, Korea limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159610] N86-15835
WEATHER FORECASTING
Large-scale circulation anomalies and the predictability of northeast Brazil droughts
[INPE-3656-PRE/819] N86-15768
Optical characteristics of lightning and thunderstorm currents N86-15788
Severe storm detection with passive 37 Ghz observations N86-15797
Detection of rotating thunderstorms using satellite imagery N86-15810
A conceptual model of the severe-storm environment for inclusion into Air Weather Service severe-storm analysis and forecast procedures
[AD-A158010] N86-15824
WEATHER MODIFICATION
Condensation potential in high thermal performance walls. Hot, humid summer climate
[AD-A158002] N86-15431

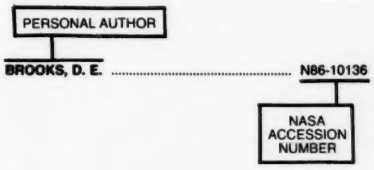
WEATHER STATIONS
Climatological data of stations in the Netherlands. No. 24: A climatology of Amsterdam airport for the period 1951 - 1980
[KNMI-150-24] N86-15837
WEIGHT (MASS)
A comparison of the effects of circuit weight training on men and women
[AD-A159419] N86-15910
Can aircraft noise less than or equal 115 to dBA adversely affect reproductive outcome in USAF women?
[AD-A158322] N86-16045
WEIGHT REDUCTION
Fundamental studies on the Aluminum-Lithium-Beryllium alloy system
[AD-A158088] N86-15381
WEIGHTING FUNCTIONS
Dynamic monotone priorities on planar sets (extended abstract)
[AD-A158610] N86-15955
Outer product calculations
[AD-A158295] N86-15991
WEIGHTLESSNESS
Effect of dry immersion model on parameters of fluid-electrolyte metabolism, blood plasma aldosterone and cortisol levels in individuals differing in body fluid content N86-15875
Determination of increment of Bacillus subtilis biomass in weightlessness N86-15881
Investigation of possibility of using two-frequency impedometry for estimation of proportion of total and extracellular body fluids N86-15888
WEIGHTLESSNESS SIMULATION
Investigations of the effects of gravity on Paramecium caudatum structure and behavior
[DFVLR-FB-85-40] N86-15863
Effect of 7-day immersion hypokinesia on characteristics of precision movements N86-15874
WELD TESTS
Fracture toughness testing of laser welds in 2 mm thick titanium alloy IMI 550
[REPT-3784/1/85] N86-15685
WELDING
Microstructural control to improve the properties of chromium-molybdenum weld metal
[DE85-016179] N86-15390
WEST GERMANY
Temperature and humidity data for design: British forces area of West Germany
[MET-O-MEMO-113] N86-15767
Kitzingen AI, Germany limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159604] N86-15829
Pirmasens AHP DL, West Germany limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159608] N86-15833
WETLANDS
Remote sensing of coastal wetlands biomass using Thematic Mapper wavebands N86-15709
WHISKERS (CRYSTALS)
Particle sizing with whisker collectors --- flow visualization
[ISL-CO-230/84] N86-15639
WHITE DWARF STARS
Theoretical models for Type 1 and Type 2 supernova
[DE85-016288] N86-16174
Recurrent population 2 X-ray transients - similarities to SU UMa cataclysmic variables
[DE85-014075] N86-16184
WHITE LIGHT HOLOGRAPHY
Use of optical fibers in pulsed holography
[ISL-CO-231/84] N86-15657
WHITE NOISE
A new approach to signal registration with the emphasis on variable time delay estimation N86-15514
Detection of periodic signal of arbitrary shape with random time delay
[AD-A158979] N86-15524
A variance detector for signal-gap discrimination in noisy speech channels
[AD-A159227] N86-15527
Efficiency of amplitude suppression on sinusoidal interference N86-15585
The detection of faint space object with solid state image detectors
[AD-A158594] N86-16166
WIGGLER MAGNETS
Theoretical studies of two-dimensional effects in free electron lasers
[AD-A158229] N86-15659
WIND (METEOROLOGY)
Automated mesoscale winds derived from GOES multispectral imagery N86-15798
Development of slope spectra of the wind-disturbed water surface N86-15842
Wave and surf forecast model evaluation for use on a micro computer
[AD-A159063] N86-15848
WIND DIRECTION
Development of slope spectra of the wind-disturbed water surface N86-15842
WIND EFFECTS
Geophysical Bulletin of Hokkaido University, no. 46
[ISSN-0439-3503] N86-15695
A numerical study on the response of the tropical Pacific sea surface temperature to a sudden change of wind stress N86-15698
A numerical modelling of the seasonal variation of the tropical Pacific sea surface temperature N86-15699
A numerical simulation of coastal mixed layer by a modified 1-D DKT model N86-15700
Development of slope spectra of the wind-disturbed water surface N86-15842
The effect of the wind in the Eemsmond (the Netherlands, West Germany) on high tide levels in Delfzijl (the Netherlands)
[KNMI-TR-63] N86-15856
WIND MEASUREMENT
Airborne Doppler measurements of the central California extended sea breeze N86-15791
Analysis of Doppler lidar data N86-15792
Airborne Doppler lidar activities N86-15793
Response of the mesoscale atmosphere to diabatic heating N86-15794
Doppler wind profile experiment N86-15818
WIND PROFILES
NASA/MSFC FY-85 Atmospheric Processes Research Review
[NASA-CP-2402] N86-15769
Multiscale modeling to evaluate proposed space-based Doppler lidar sampling strategies N86-15774
Analysis of Doppler lidar data N86-15792
Airborne Doppler lidar activities N86-15793
Response of the mesoscale atmosphere to diabatic heating N86-15794
Mesoscale: Cloud scale simulation of convective response N86-15802
Doppler wind profile experiment N86-15818
The TMA shallow-water spectrum description and applications
[AD-A157975] N86-15844
WIND SHEAR
Response of the mesoscale atmosphere to diabatic heating N86-15794
Investigations of severe/tornadic thunderstorm development and evolution based on satellite and AVE/SESAME/VAS data N86-15809
WIND TUNNEL TESTS
The experimental determination of the subsonic aerodynamic characteristics of an Ogive-Cylinder body including a comparison with theoretical estimates, volume 1
[CAR-8509] N86-15242
Investigation of a supersonic cruise fighter model flow field
[NASA-TM-86361] N86-15248
Test results from a dynamic model dynaflex rotor N86-15285
Aeroelastic considerations for torsionally soft rotors N86-15289
Prediction of wing aeroelastic effects on aircraft lift and pitching moment characteristics
[NASA-TM-87631] N86-15319
Use of hinged strakes for lateral control at high angles of attack
[AD-A158005] N86-15321
FRG uses laser for non-destructive testing in wind canal N86-15451
Results of wind tunnel tests on external combustion
[DFVLR-FB-85-35] N86-15643
WIND TUNNEL WALLS
West Europe report: Science and technology
[JPRS-WST-85-015] N86-15443
DFVLR develops new kind of walls or wind tunnel N86-15446
WIND TUNNELS
FRG uses laser for non-destructive testing in wind canal N86-15451
WIND TURBINES
Mod-5A wind turbine generator program design report. Volume 2: Conceptual and preliminary design, book 1
[NASA-CR-174735-VOL-2-BK-1] N86-15722
Mod-5A wind turbine generator program design report. Volume 2: Conceptual and preliminary design, book 2
[NASA-CR-174735-VOL-2-BK-2] N86-15723
Mod-5A wind turbine generator program design report. Volume 3: Final design and system description, book 1
[NASA-CR-174735-VOL-3-BK-1] N86-15724
Mod-5A wind turbine generator program design report. Volume 3: Final design and system description, book 2
[NASA-CR-174735-VOL-3-BK-2] N86-15725
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 1
[NASA-CR-174735-VOL-4-BK-1] N86-15726
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 2
[NASA-CR-174735-VOL-4-BK-2] N86-15727
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 3
[NASA-CR-174735-VOL-4-BK-3] N86-15728
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 4
[NASA-CR-174735-VOL-4-BK-4] N86-15729
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 5
[NASA-CR-174735-VOL-4-BK-5] N86-15730
System engineering and energy cost analysis of small and medium wind turbines
[DE85-012159] N86-15738
WINDMILLS (WINDPOWERED MACHINES)
The flapping movement and frequency of rotating windmill wings defined with a differential equation
[IW-R501] N86-15255
WINDOWS (APERTURES)
Athermal conditions of optical elements and properties of optical materials N86-15423
WINDPOWER UTILIZATION
Mod-5A wind turbine generator program design report. Volume 2: Conceptual and preliminary design, book 1
[NASA-CR-174735-VOL-2-BK-1] N86-15722
Mod-5A wind turbine generator program design report. Volume 2: Conceptual and preliminary design, book 2
[NASA-CR-174735-VOL-2-BK-2] N86-15723
Mod-5A wind turbine generator program design report. Volume 3: Final design and system description, book 1
[NASA-CR-174735-VOL-3-BK-1] N86-15724
Mod-5A wind turbine generator program design report. Volume 3: Final design and system description, book 2
[NASA-CR-174735-VOL-3-BK-2] N86-15725
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 1
[NASA-CR-174735-VOL-4-BK-1] N86-15726
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 2
[NASA-CR-174735-VOL-4-BK-2] N86-15727
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 3
[NASA-CR-174735-VOL-4-BK-3] N86-15728
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 4
[NASA-CR-174735-VOL-4-BK-4] N86-15729
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 5
[NASA-CR-174735-VOL-4-BK-5] N86-15730
WINDPOWERED GENERATORS
Mod-5A wind turbine generator program design report. Volume 2: Conceptual and preliminary design, book 1
[NASA-CR-174735-VOL-2-BK-1] N86-15722
Mod-5A wind turbine generator program design report. Volume 2: Conceptual and preliminary design, book 2
[NASA-CR-174735-VOL-2-BK-2] N86-15723
Mod-5A wind turbine generator program design report. Volume 3: Final design and system description, book 1
[NASA-CR-174735-VOL-3-BK-1] N86-15724
Mod-5A wind turbine generator program design report. Volume 3: Final design and system description, book 2
[NASA-CR-174735-VOL-3-BK-2] N86-15725
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 1
[NASA-CR-174735-VOL-4-BK-1] N86-15726
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 2
[NASA-CR-174735-VOL-4-BK-2] N86-15727
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 3
[NASA-CR-174735-VOL-4-BK-3] N86-15728
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 4
[NASA-CR-174735-VOL-4-BK-4] N86-15729
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 5
[NASA-CR-174735-VOL-4-BK-5] N86-15730
WINDS ALOFT
Airborne Doppler measurements of the central California extended sea breeze N86-15791
WING FLAPS
MBB studies variable-camber wing for Airbus N86-15449
WING PROFILES
Studies on the interference of wings and propeller slipstreams N86-15241
WING TIP VORTICES
Numerical solutions for three-dimensional cases: Delta wings N86-15264
WINGS
Studies on the interference of wings and propeller slipstreams N86-15241

Design considerations for application of laminar flow control systems to transport aircraft N86-15270
Prediction of the drag of wings at subsonic speeds by viscous/inviscid interaction techniques N86-15274
WORK CAPACITY
Light helicopter family trade-off analysis. Volume 7: Appendix R
[AD-A158076] N86-15307
Some aspects of determining human physical work capacity under hyperbaric conditions N86-15867
Effect of level of physical activity on lipid metabolism of flight personnel N86-15871
WORK FUNCTIONS
Energy function and conductivity of metal-polymer composites N86-15347
WORKLOADS (PSYCHOPHYSIOLOGY)
Problems of studying flight work in Soviet aviation medicine of the 1920's - 1930's N86-15866
Some aspects of determining human physical work capacity under hyperbaric conditions N86-15867
Effect of threat stress on psychomotor stability of pilots differing in anxiety level N86-15869
Use of flight simulators for demonstration of functional capacities of flight personnel N86-15870
Effect of level of physical activity on lipid metabolism of flight personnel N86-15871
WYOMING
Biochemical processes in sagebrush ecosystems: Interactions with terrain
[E86-10015] N86-15705

X

X RAY ANALYSIS
Multi-color X-ray line source
[AD-D011910] N86-16088
X RAY DIFFRACTION
Standard X-ray diffraction powder patterns
[NBS/MN-25-SEC-21] N86-15357
X-ray elastic constants and their meaning for Al and Fe
[AD-A158251] N86-15382
X RAY IRRADIATION
On the effects of X irradiation on the Bacillus subtilis spores in a day and wet system
[DFVLR-FB-85-44] N86-15864
X RAY SOURCES
Multi-color X-ray line source
[AD-D011910] N86-16088
Recurrent population 2 X-ray transients - similarities to SU UMa cataclysmic variables
[DE85-014075] N86-16184
X RAY STRESS ANALYSIS
X-ray elastic constants and their meaning for Al and Fe
[AD-A158251] N86-15382
X RAYS
Flash X-ray with image enhancement applied to combustion events
[AD-A159328] N86-15369
Advances in radiobiological research: Hypoxic irradiation effects N86-15894
XENON CHLORIDE LASERS
Delay effect in pulsed avalanche discharge of an XeCl laser at high gas pressure N86-15482
XV-15 AIRCRAFT
Performance and loads data from a hover test of a full-scale XV-15 rotor
[NASA-TM-86833] N86-15243

Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The NASA accession number denotes the number by which the citation is identified.

A

ABARA, L. P. N86-15599
ABELSON, H. N86-15963
ABLOWITZ, M. J. N86-16030
ACHTEMEIR, G. L. N86-15777
ACKERMAN, M. N86-15753
ACKLESON, S. G. N86-15706
N86-15707
N86-15708
ADAMS, D. F. N86-15349
ADAMS, E. N86-15733
ADAMS, G. N86-15415
ADAMS, N. N06-15963
ADLER, L. N86-16051
ADOMAYTIS, E. N86-15596
ADZHALOV, A. R. N86-15491
ADZHEMYAN, E. K. N86-15504
AFFATICA, J. P. N86-15650
AFONIN, A. V. N86-15496
AGA, K. N86-16103
ALANEN, E. N86-15535
ALBE, F. N86-15657
ALFIMOV, M. V. N86-15582
ALFVEN, H. N86-16175
N86-16177
ALI, I. N86-16028
ALIYEVSKIY, B. L. N86-15606
ALLAKHVERDIYEV, A. M. N86-15615
ALLECA, J. P. N86-15825
ALLEN, G. R. N86-15655
ALPEROVICH, L. S. N86-15570
ALTROCK, R. C. N86-16179
AMALDI, E. N86-15533
ANDERSON, C. E. N86-15810
ANDREOZZI, L. C. N86-15334
ANDREYEV, V. M. N86-15615
ANGEL, M. V. N86-15745
ANGHEL, C. N86-15410
ANSARI, K. A. N86-15524
ANTHES, J. P. N86-16067
ANTONYAN, A. A. N86-15883
ANTOSHCHUK, V. G. N86-15506
AOKI, T. N86-16108
AOMURA, K. N86-15424
ARKHIPOV, V. V. N86-15872
ARMAND, N. A. N86-15464
ARMSTRONG, R. N. N86-15307
ARMSTRONG, R. W. N86-15413
ARNOLD, J. E. N86-15818
ARNOLD, R. T. N86-15771
ARRHENIUS, G. N86-16175
ASSANIS, D. N. N86-16164
ASTAKHOV, V. I. N86-15607
ASTANIN, L. Y. N86-15576
ATKINSON, J. N86-15733
ATKINSON, R. J. N86-15798
N86-15819
AUSTIN, E. E. N86-15282
AUVINE, B. N86-15785
AVERY, R. T. N86-16064
AVETISYANTS, B. L. N86-15891
AVRAMENKO, V. L. N86-15571
AWSCHALOM, M. N86-16117
AXNAES, I. N86-16177
AZLER, K. M. N86-16136
AZUMANE, S. N86-15696

B

BAAIJENS, M. N. N86-16032
N86-16033
BABCOCK, C. D. N86-15348
BABKINA, T. V. N86-15605
BACK, L. H. N86-15249
BAHRAMI, H. N86-15304
BAI, J. M. N86-15395
BAI, Z. D. N86-16000
BAILEY, R. S. N86-16044
BAIOI, M. N86-16003
BAKALE, G. N86-15861
BAKEWELL, H., JR. N86-15830
BALLUFFI, R. W. N86-15387
BANG, G. S. N86-16043
BANKS, H. G., III N86-15325
BANKS, S. P. N86-15980
N86-15981
BAOZHONG, Y. N86-15442
BAR-NESS, Y. N86-15520
BARBACCI, M. R. N86-15952
BARBULESCU, E. N86-15409
BARE, E. A. N86-15248
BARENDSZ, A. W. N86-15649
BARHEN, J. N86-15979
BARLOW, R. N86-15736
BARNARD, J. C. N86-15703
BARNES, P. D. N86-16070
BARR, T. A., JR. N86-15666
BARRIE, J. D. N86-16130
BARRON, R. R. N86-15558
BARTENWERFER, M. N86-16053
BARTLEY, D. N86-15963
BARTLEY, J. L. N86-16161
BASS, F. G. N86-15578
BATISTA, P. P. N86-15754
BATRA, R. C. N86-15670
BAUMANN, R. J. N86-15647
BAYBULATOV, F. K. N86-15564
BAZUNOVA, Y. G. N86-15888
BEDER, J. N86-15994
BEDRIK, B. G. N86-15346
BELAKOVSKIY, M. B. N86-15880
BELL, R. N86-15740
BELOSHEVSKIY, V. Y. N86-15928
BELOUSOV, A. I. N86-15345
BEMESDERFER, J. N86-16157
BEN-ZVI, I. N86-16124
BENSON, D. J. N86-15968
BENTON, E. V. N86-15332
BEREZYUK, B. M. N86-15941
BERGER, M. N86-15365
BERGTER, F. N86-15881
BERMAN, A. N86-15282
BERNIUS, M. T. N86-15362
BERTA, E. M. N86-15308
BESOLD, R. N86-16070
BESSON, J. N86-15753
BESUNER, P. N86-15688
N86-15689
BETHKE, K. H. N86-15539
BETZINA, M. D. N86-15243
BEZRUCHKO, B. P. N86-15611
BEZRYAKIN, N. N. N86-15485
BICKES, R. W., JR. N86-15418
BILBRO, J. W. N86-15793
BILLINGS, S. A. N86-16029
BILLS, K. W., JR. N86-15411
BIRD, J. C. N86-15755
BIRMAN, K. P. N86-15959
BISHOP, J. E. N86-15749
BITTENCOURT, G. N86-15985
BLACIC, J. D. N86-16176
BLAKE, J. B. N86-15757
BLAKESLEE, R. J. N86-15788
N86-15790
BLALOCK, W. R. N86-15334
BLEISTEIN, N. N86-15958
BLUM, G. N86-15627
BOBROV, P. P. N86-15500
BODROV, V. A. N86-15870
BOEHM, H. N86-15354
BOERSTOEL, J. W. N86-15259
BOGATYREV, V. A. N86-15933
BOGDANOVA, N. N. N86-15887
BOGOMOLOV, A. F. N86-15510
BOHLIN, T. N86-15673
BOLLINGER, L. M. N86-16081
BOLZ, E. H. N86-15518
BONDARENKO, M. V. N86-15607
BONIFAZI, P. N86-15533
BORGER, G. R. N86-15823
BORGHESE, F. N86-15758
BORING, A. M. N86-16080
BORODIN, A. N86-15978
BOSS, N. K. N86-15996
BOURKE, R. H. N86-15845
N86-15849
BOUSMAN, W. G. N86-15266
BOWDLE, D. A. N86-15813
BOYER, M. J. N86-15971
BOYES, J. D. N86-16125
BRADBURY, C. A. N86-15391
BRADFIELD-SMITH, W. L. N86-16047
BRAILSFORD, A. D. N86-15355
N86-15356
BRASLOW, A. L. N86-15270
BRENNAN, J. M. N86-16124
BRENNAN, S. M. N86-15339
BRENNING, N. N86-16177
BRENNY, M. K. N86-15956
BRIGGS, R. A. N86-15331
BRIGGS, R. J. N86-16059
BRINNER, A. N86-15739
BROADBENT, S. N86-15734
BROOK, M. N86-15787
BROOKS, G. N86-15963
BROUSSARD, J. R. N86-15320
BROWN, J. R. N86-15962
BROWNING, J. S. N86-16068
BRUBAKER, P. A. N86-16045
BRYANTSEVA, L. A. N86-15867
BUBENNIKOV, A. N. N86-15487
BUCKALEW, W. H. N86-15407
BUDAGYAN, I. F. N86-15577
BUDDEMEIER, R. W. N86-16076
BUKALOV, Y. Y. N86-15868
BULLARD, E. M. N86-15353
BUNKER, M. E. N86-16173
BUREYEV, V. A. N86-15472
BURKOVSKAYA, T. Y. N86-15877
BURNS, J. E. N86-15978
BURNS, K. C. N86-15899
BURROWS, J. L. N86-15918
BURROWS, R. W. N86-15656
BUSHNELL, D. M. N86-15271
BUSHUYEVA, Y. M. N86-15345
BUSKIRK, F. R. N86-16057

C

CABLE, J. W. N86-16134
CAGLAYAN, A. K. N86-15278
CALOGERO, F. N86-16008
CAMPARO, J. C. N86-16056
CAMPBELL, R. L., SR. N86-15430
CANNELLI, G. N86-16141
CANTELLI, R. N86-16141
CANTOR, A. J. N86-15662
CAP, J. S. N86-16125
CARLSTROEM, A. N86-15536
CARPENTER, M. K. N86-15552
CARR, B. J. N86-16168
CARROLL, J. J. N86-15791
CARTER, L. D. N86-15742
CASSOU, R. N86-15332
CASTELLANI, C. N86-16142

CEBECI, T. N86-15244
CHABDAROVA, R. N. N86-15879
CHALLENOR, P. G. N86-15853
CHAN, S. W. N86-15387
CHANDRA, S. N86-15362
CHANG, J. N86-15655
CHANG, K. C. N86-15244
CHANG, R. K. N86-16091
CHANTERET, P. Y. N86-15254
CHAO, T. H. N86-15520
CHASTAIN, P. A. N86-15687
CHAUSSEE, D. S. N86-15627
CHAVIS, C. S. N86-16064
CHEN, O. Y. N86-15377
CHEN, S. Y. N86-15282
CHENETTE, D. L. N86-15757
CHERAPANOVA, M. N. N86-15580
CHEREPENNIKOV, V. V. N86-15621
CHERITON, D. R. N86-15526
CHERNUSHENKO, A. M. N86-15465
CHERNYSHEVA, S. D. N86-15493
CHERRY, S. M. N86-15429
CHESNOKOV, Y. A. N86-15602
CHIGOGIDZE, Z. N. N86-15589
CHIOCCHIA, G. N86-15260
CHIU, W. N86-16165
CHKHARTISHVILI, L. S. N86-15589
CHO, Y. I. N86-15249
CHOPRA, I. N86-15296
N86-15297
CHOW, P. N86-16128
CHOW, T. P. N86-15547
N86-15548
CHOZEV, Y. N86-15365
N86-15366
CHRISTENSEN, S. K. N86-15908
CHRISTIAN, H. J. N86-15786
CHU, B. T. N86-16091
CHUNG, T. J. N86-15414
CINI, M. N86-16147
CIOCCI, F. N86-15665
CISNEROS, J. M. N86-15763
CLARK, J. E. N86-15776
CLARK, R. N86-15327
CLARK, R. E. N86-15517
CLAUS, H. H. N86-15644
CLEEK, N. H. N86-15306
N86-15307
N86-15308
N86-15309
CLEMESHA, B. R. N86-15754
CLINGER, W. N86-15963
CLINTHORNE, J. C. N86-15530
COCCIA, E. N86-15533
COFFEY, C. S. N86-15413
COFFEY, H. E. N86-16181
N86-16182
COGHLAN, W. A. N86-15356
COHEN, J. B. N86-15382
N86-15691
COHEN, J. K. N86-15958
COLE, J. D. N86-15250
COLLIER, M. N86-15976
COLLINS, W. D. N86-15391
COLLINS, W. E. N86-15905
COLSON, W. B. N86-15665
COMFORT, R. H. N86-15755
COMMANDER, K. W. N86-16042
CONBERE, W. N86-15714
CONLEY, L. A. N86-15742
COOKE, M. P. N86-16037
CORDERO, F. N86-16141
CORREIA, E. N86-16178
COSTA, J. E. R. N86-16178
COX, N. W. N86-16129
CRANWELL, R. M. N86-15762
CRAWFORD, O. H. N86-16063
CREWE, M. E. N86-15787
CROSS, E. F. N86-16073
CRUM, L. A. N86-16042
CRUMLEY, L. M. N86-15916
CURREN, A. N. N86-15394
CURTIS, G. S. N86-15917

D

DA-TE, T. N86-15426
N86-15427
N86-15428
DAHUA, Z. N86-15480
DANCEWICZ, A. M. N86-15894
DANFORD, M. D. N86-15359
DANILOV, A. A. N86-15492
DANILOV, V. A. N86-15585
DANYUSHINA, A. M. N86-15347
DAROOKA, D. N86-16165
DATTOLI, G. N86-15665
DAVARI, B. N86-16133
DAVIES, A. G. N86-15854
DAVIS, H. P. N86-15655
DAVIS, L. P. N86-15343
DAVIS, M. W. N86-15302
N86-15303
DAVIS, R. F. N86-16132
DAVIS, T. J. N86-15647
DAVYDOV, V. N. N86-15486
DAVYDOVA, N. A. N86-15880
DAWSON, S. N86-15286
DEAN, R. G. N86-15363
DEERING, S. E. N86-15526
DEFREITAS, F. L. G. N86-15985
DEGASPERIS, A. N86-16009
N86-16030
DELOACH, R. N86-16041
DEMARIA, A. J. N86-15662
DEMMEL, J. N86-15838
DENHAM, D. H. N86-16155
DEVENDORF, L. E. N86-15848
DEVINE, T. J. N86-15691
DEVITTOR, P. N86-15437
DEWITT, L. M. N86-15847
DIAK, G. R. N86-15805
DICASTRO, C. N86-16142
DICK, R. D. N86-16176
DICKERSON, M. N86-15817
DIEBOLD, G. E. N86-16070
DIEMOZ, M. N86-16072
DIETZ, R. N. N86-15743
DILLON, W. G. N86-15748
DIRUSSO, E. N86-15313
DIVSALAR, D. N86-15333
DIXON, R. D. N86-16119
DOBROVOLSKIS, Z. N86-15596
DOLGIN, A. V. N86-15460
DOMMERMUTH, F. N86-16039
DONALDSON, A. N86-16116
DONGARRA, J. J. N86-15974
DORAN, J. A. N86-15693
DORN, L. N86-15694
DOWELL, E. H. N86-15284
DRAKE, S. N86-15852
DRONOV, A. S. N86-15485
DRUGOVA, N. A. N86-15882
DRUMM, D. N86-15279
DUBININ, D. M. N86-15891
DUCROCQ, A. N86-15445
DUGGIN, M. J. N86-15711
DUNCAN, J. H. N86-15901
DUNN, B. N86-15664
N86-16130
DUTHIE, J. G. M. N86-16092
DUTTA, S. K. N86-15298
DUTTON, J. A. N86-15776
DUVAL, R. W. N86-15304
DZHALA, R. M. N86-15463
DZHELEPOVA, N. B. N86-15615

E

EARL, W. K. N86-15916
ECKSTROM, C. V. N86-15319
EDWARDS, J. B. N86-15674
EGNELL, R. N86-15673
EISENHAURE, D. B. N86-15338
EKCHIAN, J. E. N86-16164
ELBAN, W. L. N86-15413
ELDRIDGE, B. R. N86-15990
ELIASON, J. R. N86-15703
ELLIS, A. B. N86-15552
EMMITT, G. D. N86-15774
ENDERLE, J. D. N86-15909
ERB, R. E. N86-15321
ESAKI, L. N86-15550
EVANS, E. H. N86-15357
EVERSOLE, J. D. N86-16088
EVIN, B. N86-15960
EXALTO, H. J. N86-15537

F

FAGOT, H. N86-15657
FALCIONI, M. N86-16145
FALES, C. L., JR. N86-16089
FANOUS, F. N86-15389
FARRINGTON, G. C. N86-15664
N86-16130
FEDDER, J. A. N86-15760
FEDIRKO, V. A. N86-15616
FEDOROV, S. Y. N86-15471
FEDOROV, Y. N. N86-15570
FEDOROVA, I. A. N86-15505
FELD, Y. N. N86-15563
FELIPPEDESOUZA, J. A. M. N86-15986
N86-15987
FELKER, F. F. N86-15243
FENGMU, D. N86-15439
FENNELL, J. F. N86-15757
FERRANDO, W. A. N86-15351
FERRONI, F. N86-16072
FESSENDEN, T. J. N86-16064
N86-16085
FIARMAN, S. N86-16083
FICHTNER, K. N86-15600
FICO, R. N86-15306
FIDDES, S. P. N86-15251
FIFER, R. C. N86-15900
FILIPPOV, V. S. N86-15455
FISCHER, M. C. N86-15270
FISCHER, M. J. N86-15955
N86-15978
N86-16150
FISCHLER, M. A. N86-15713
FISHER, R. N86-16180
FISHER, R. R. N86-16179
FITZJARRALD, D. R. N86-15770
N86-15793
FLAHERTY, J. E. N86-15997
FLAMING, R. M. N86-16157
FLATT, D. N86-15856
FLORSCHUETZ, L. W. N86-15625
FLOWERS, O. L. N86-15335
FLYNN, R. N86-15308
FLYTZANI-STEPHANOPOULOS, M. N86-15360
FOGELMAN, R. P. N86-15720
FOLEY, M. N86-15684
FOMINTSEV, S. S. N86-15574
FOOTE, H. P. N86-15703
FOSTER, J. C., JR. N86-15559
FOTE, A. A. N86-15551
FOWLIS, W. W. N86-15773
FOX, C. G. N86-15846
FOXWORTHY, P. T. N86-15324
FRANK, A. N86-15332
FRANK, R. M. N86-16164
FRANKE, R. N86-16006
FRANKLIN, G. N86-16070
FRANTSUZOVA, N. B. N86-15507
FRASCA, S. N86-15533
FRENCH N86-15317
FRIDBERG, P. S. N86-15609
FRIEDMANN, P. P. N86-15294
FRIEDRICH, R. N86-15645
FROEDE, A. O., III N86-15555
FROST, C. A. N86-16067
FRUEHOLZ, R. P. N86-16056
FU, J. S. N86-16137
FUELBERG, H. E. N86-15807
N86-15811
FUJIKI, T. N86-15695
FUJITA, T. T. N86-15796

G

GABAL, R. N86-15300
GABYSHEV, V. K. N86-15872
GAFIYCHUK, V. V. N86-15597
GALKIN, V. I. N86-15502
GAMIN, P. V. N86-15934
GANGWANI, S. T. N86-15288
GANSHIN, Y. A. N86-15498
GAONKAR, G. H. N86-15293
GARB, K. L. N86-15609
GARCIA, C. N86-16180
GARMIRE, E. N86-16090
GARRETT, R. P. N86-15849
GAVALAS, G. R. N86-15360
GAVALESHKO, N. P. N86-15506
GAZENKO, O. G. N86-15865
GELLES, D. S. N86-15384
GERSHENZON, Y. M. N86-15618
GERTOBERENS, K. N86-15436
GHONIEM, N. M. N86-15384
GHOSH, M. N86-16020
GIANSANTI, A. N86-16010
GIBBS, W. S. N86-15388
GIDLEVSKIY, A. V. N86-15500
GIKADI, T. N86-16053
GILGENBACH, R. M. N86-15660
GILL, R. J. N86-15416
GINZBURG, L. D. N86-15587
GIPPA, M. N86-15669
GIRARD, A. N86-15753
GIRAUD, M. N86-15253
GITTOS, M. F. N86-15685

GLADHILL, D. M. N86-15357
GLASER, P. H. N86-15704
GLEYZER, S. Y. N86-15468
GLOVER, D. J. N86-15413
GOETERS, K. M. N86-15915
GOFF, D. R. N86-15370
GOLDBERG, M. S. N86-15311
GOLDHABER, G. N86-16069
GONOV, S. Z. N86-15597
GONZALEZ, R. R. N86-15904
GOODMAN, R. K. N86-15285
GOODMAN, S. J. N86-15782
N86-15784
N86-15789
GOODWIN, E. L. N86-15352
GORBATYUK, A. V. N86-15601
GORDON, J. R. N86-15685
GORIN, B. N. N86-15503
GOROTOV, V. D. N86-15599
GOUGH, D. E. N86-16064
GOURDIN, M. N86-16031
GRABBE, R. N86-15740
GRABLE, A. L. N86-15650
GRAF, W. O. N86-15911
GRAGG, R. F. N86-16048
GRAY, S. L. N86-15391
GREENE, K. J. N86-15950
GREENE, W. A. N86-15813
GREGORY, D. A. N86-16092
GREIMANN, L. N86-15389
GREKHOV, I. V. N86-15601
GRESHISCHEV, Y. M. N86-15583
GRIDLEY, D. N86-16040
GRIFFETH, N. D. N86-16150
GRIFFITH, W. M. N86-15383
GRIGORYEV, V. P. N86-15591
GRIGORYEVA, G. V. N86-15602
GRIGORYEVA, L. S. N86-15874
GRILLO, D. A. N86-15720
GROSS, R. L. N86-15326
N86-15367
GRUZORYANTS, V. V. N86-15605
GUANSHEN, Z. N86-15483
GUBERMAN, S. L. N86-16054
GUESS, F. N86-16013
GUIBAS, L. J. N86-16150
GUILBERT, J. M. N86-15444
GUNN, D. E. N86-15855
GUNTER, U. N86-15881
GUPTA, S. S. N86-16022
GUREVICH, G. L. N86-15488
GURUMOORTHY, B. N86-16004
GUZHEVSKAYA, A. V. N86-15508
GUZIK, V. F. N86-15931
GVOZDEV, V. I. N86-15465
GYORFFY, B. L. N86-16035

H

HABEL, R. N86-15533
HABER, F. N86-15520
HACKETT, J. E. N86-15273
HADLEY, G. R. N86-15972
HAGENAARS, J. A. P. N86-16026
HAGIN, F. G. N86-15958
HAIGHT, R. P. N86-15334
HAIMBACH, S. P. N86-15842
HAKEN, R. K. T. N86-16117
HALL, C. M. N86-15522
HALL, P. N86-15628
N86-15629
N86-16016
HALL, R. L. N86-15690
HALLIKAINEN, M. N86-15534
HALLOCK, D. W. N86-15291
HALVERSON, W. N86-15554
HANCOCK, G. J. N86-15686
HANERFELD, H. N86-16082
HANSEN, A. R. N86-15781
HANSEN, G. J. N86-15971
HANSON, D. A. N86-15742
HARDISKY, M. A. N86-15706
N86-15709
HARIMAYA, T. N86-15695
N86-15696
HARLEMAN, R. N86-15733
HARMON, B. N. N86-16139
HARRIES, W. L. N86-15391
N86-15393
HARRIS, F. R. N86-15671
HART, J. N86-15772
HART, R. A. N86-15662
HARTMANN, R. N86-15881
HARVEY, G. A. N86-15692
HARZ, D. N86-15881
HASEGAWA, Y. N86-15396
HATHAWAY, D. H. N86-15773
HAWAGUCHI, M. N86-15428
HAYASHI, T. N86-15379
HAYDEN, C. N86-15808
HEBB, R. C. N86-15654
HEGYI, D. J. N86-16166
HEILMANN, W. N86-15314
HEINE, E. N86-15560
HEMMERSBACH, R. N86-15863
HENDERSON, T. F. N86-16064
HENKE, R. N86-15332
HERMANSON, L. A. N86-15334
HERNDON, J. M. N86-15759
HERTZOG, D. W. N86-16070
HESS, C. F. N86-15653
HESSE, T. N86-15881
HEWETT, D. W. N86-16123
HEYSE, E. C. N86-15367
HEYWOOD, J. B. N86-16164
HIBBARD, B. N86-15816
HICKEY, J. S. N86-15817
HICKMAN, P. N86-15309
HICKMAN, P. W. N86-15307
HICKMAN, R. N86-15399
HIGGINS, E. A. N86-15905
HIRAMATSU, C. N86-15696
HIROTA, K. N86-15398
HIRSCHFELD, T. N86-15652
HISADOME, K. N86-15423
HODGDON, J. A. N86-15910
HOFFMANN, H. E. N86-15838
HOFFSOMMER, J. C. N86-15413
HOLDEN, N. E. N86-16086
HOLIAN, K. S. N86-15967
HOLL, J. A. N86-15902
HOLMES, S. D. N86-16078
HOLST, T. L. N86-15246
HOLT, J. L. N86-15634
HONGCHUN, Y. N86-15479
HONGFANG, C. N86-15442
HONMA, K. N86-15397
HOOPER, W. E. N86-15283
HORIOKA, K. N86-16098
HOROWITZ, E. N86-15953
HOU, T. H. N86-15395
HOUGHTON, D. D. N86-15804
HOULE, M. J. N86-15740
HOWERTON, R. J. N86-16061
HOWLAND, M. R. N86-15797
N86-15821
HSU, D. K. N86-16051
HUBA, J. D. N86-15760
HUBBARD, C. R. N86-15357
HUCKABEE, L. L. N86-16092
HUDSON, W. N. N86-16017
HUGHES, S. A. N86-15844
HULTON, V. N. N86-16153
HUNG, R. J. N86-15800
HUNT, E. N86-15957
HUNTER, R. L. N86-15762
HUNTER, T. C. N86-15720
HUSBANDS, C. R. N86-15532
HUTCHINSON, D. R. N86-15752
HUXEL, T. R. N86-15921
HYER, M. W. N86-15687

I

IBRAGIMOV, R. S. N86-15587
INOUE, K. N86-15425
ISHERWOOD, D. N86-16076
ISHIGAKI, I. N86-16099
ITO, M. N86-16103
N86-16104
ITOH, Y. N86-15989
ITSKHOKI, Y. S. N86-15575
IUSIM, R. N86-15635
IVANOV, A. G. N86-15598
IVANOV, L. P. N86-15498
N86-15499
IVANOVA, V. M. N86-15580
IWASA, H. N86-15425

J

JACOBSON, E. A. N86-15714
JAKUBOWICZ, O. G. N86-16143
JAMES, B. N86-16025
JAMES, J. R. N86-15522
JAMES, K. L. N86-16025
JAMET, F. N86-15254
JEDLOVEC, G. J. N86-15812
N86-15819
JELENSKA, M. M. N86-15894
JENSEN, K. A. N86-15394
JIANIAN, G. N86-15439
JIANJUN, Z. N86-15441
JITIANU, G. N86-15409
JOHNS, W. E. N86-15841
JOHNSON, C. A. N86-16165
JOHNSON, D. A. N86-15247
JOHNSON, D. D. N86-16035
JOHNSON, D. R. N86-15795
JOHNSON, J. K. N86-16121
JOHNSON, K. A. N86-15385
JOHNSON, L. E. N86-15519
JOHNSON, R. L. N86-15784
JOHNSON, R. P. N86-16077
JONES, D. J. N86-15261
JONES, R. N86-15290
JOOSSE, P. A. N86-15255
JORDAN, K. C. N86-16171
JORGENSEN, G. J. N86-15656
JURGENS, R. F. N86-15333

K

KABITSKAYA, O. Y. N86-15877
KAFFES, D. G. N86-16019
KAJI, K. N86-15425
KAKI, K. N86-16109
KALB, M. W. N86-15803
N86-15808
KALINUSHKIN, V. P. N86-15595
KALLIANPUR, G. N86-15908
KALMAN, R. E. N86-16027
KAMENETS, F. F. N86-15592
KAMMASH, T. N86-15660
KANARI, S. I. N86-15695
N86-15700
KANAYA, T. N86-15425
KANE, R. P. N86-16012
KANEKO, S. N86-16114
KANTOR, L. Y. N86-15494
KAPILEVICH, B. Y. N86-15467
KARASEV, M. V. N86-15946
KARITANI, S. N86-15817
KARP, R. M. N86-15968
KARPYSHEV, I. L. N86-15498
KASH, S. W. N86-16058
KASISCHKE, E. S. N86-15530
KASPEROVICH, A. N. N86-15935
KASSEM, N. N86-15673
KASSNER, T. F. N86-15386
KASUYA, K. N86-16098
KATKOV, A. Y. N86-15879
KATZER, E. N86-15842
KAUFMANN, P. N86-16178
KAWAGUCHI, M. N86-15427
KAWATA, S. N86-16107
N86-16108
N86-16109
N86-16110
N86-16111
KEDEM, B. N86-15996
KEEFE, D. N86-16064
KEEVER, J. N86-15358
KELLER, D. N86-15817
KELLY, M. D. N86-15403
KENNEDY, J. T. N86-15662
KENNINGTON, J. N86-16028
KERNS, C. N86-16079
KERNS, Q. N86-16079
KESACK, W. N86-15300
KHALDINA, M. A. N86-15605
KHARIN, V. V. N86-15870
KHARITONOV, A. G. N86-15568
KHARITONOVA, Y. A. N86-15495
KHITROVA, O. N. N86-15347
KHRYASHCHEVA, L. A. N86-15889
KHUCHUA, N. P. N86-15589
KIBARDINA, I. N. N86-15464
KIDDER, S. Q. N86-15777
KIKUCHI, K. N86-15696
N86-15697
KILIAN, K. N86-16070
KIM, O. K. N86-15402
KIM, W. C. N86-16023
KING-HELE, D. G. N86-15828
KING, H. L. N86-15854
KING, L. D. N86-15518
KING, L. S. N86-15247
KIRAKOSYANTS, V. Y. N86-15472
KIRCHHOFF, V. W. J. H. N86-15754
KIRCHNER, H. O. K. N86-16004
KIRIK, Y. M. N86-15495
KIRMASOV, V. I. N86-15512
KIRSANOV, Y. A. N86-15500

KITAGAWA, Y. N86-16102
KITAMURA, A. N86-16099
KITTLESEN, G. P. N86-15553
KIYAK, S. G. N86-15597
KIYANAGI, Y. N86-15425
KLAINER, S. M. N86-15756
KLEMAS, V. N86-15706
N86-15707
N86-15708
N86-15709
KLEPP, H. J. N86-15982
KLIMOV, A. V. N86-15456
KLINGENBERG, G. N86-15641
KLOUS, Z. N86-15649
KNOENER, R. N86-15477
KO, W. L. N86-15350
KOCH, P. G. N86-15310
KOGA, M. N86-15700
KOGA, R. N86-16137
KOL, J. N86-15365
N86-15366
KOLASINSKI, W. A. N86-16137
KOLCHINA, G. A. N86-15622
KOLESNIKOV, V. N. N86-15466
KOLEV, N. I. N86-15646
KOLVA, J. R. N86-15719
KONDALVEV, A. I. N86-15583
KONONOV, Y. D. N86-15586
KONOVALOV, Y. D. N86-15885
KONYUKHOV, A. V. N86-15602
KOPAYEV, Y. V. N86-15490
KOPCZEWSKI, M. R. N86-15418
KOPECKY, K. J. N86-15773
KOPP, F. J. N86-15802
N86-15806
KOPPA, R. J. N86-15926
KOREZLIOGLU, H. N86-16014
KORNEYEV, V. A. N86-15498
KOROLKOV, V. I. N86-15614
KOROTKIN, B. A. N86-15587
KOROTKOV, S. V. N86-15601
KOSHMAN, V. I. N86-15599
KOSKINEN, H. E. J. N86-15764
KOTOVSKAYA, A. R. N86-15878
KOTTAPALLI, S. B. R. N86-15303
KOVALENKO, Y. A. N86-15872
KOZLOVSKAYA, I. B. N86-15874
KRAKOVSKIY, V. A. N86-15622
KRAMER, D. P. N86-15403
KRAMER, J. N86-15475
KRASILNIKOV, V. N. N86-15571
KRASNOKUTSKII, P. G. N86-15624
KRASNOV, I. B. N86-15878
KRAUSS, R. J. N86-15816
KREITH, F. N86-15736
KREVSKIY, M. A. N86-15573
KRIDER, E. P. N86-15788
KRIKUN, I. S. N86-15879
KRIVANDIN, V. A. N86-15624
KRIVITSKAYA, R. Y. N86-15579
KRIVOSHEYEV, M. I. N86-15495
KROGMANN, F. N86-15275
KROTKUS, A. N86-15596
KROTOV, V. P. N86-15888
KRYUCHKOV, V. V. N86-15568
KUDRYASHOV, M. I. N86-15564
KUDRYASHOVA, Z. M. N86-15879
KULAYEV, B. S. N86-15888
KUPRIYANOV, A. A. N86-15870
KURIKSHA, A. A. N86-15567
KURTZ, S. R. N86-15406
KURYUZHIN, S. V. N86-15605
KUTIKOVA, N. P. N86-15507
KUWABARA, H. N86-16098
KUZMIN, V. A. N86-15602
KUZNETSOV, A. P. N86-15505
KVITKA, A. A. N86-15493
KWOK, M. A. N86-16073

L

LANCRAFT, R. E. N86-15278
LANDGREBE, A. J. N86-15302
LANDWEBER, L. N86-15995
LANGDON, A. B. N86-16123
LANICCI, J. M. N86-15824
LAPA, V. V. N86-15868
LARINA, E. T. N86-15468
LARSEN, R. J. N86-15741
LARSON, R. W. N86-15530
LASLETT, L. J. N86-16085
LATUSHKIN, V. V. N86-15584
LAUB, A. J. N86-15970
LAURENT, J. N86-15753
LAZARETH, O. W. N86-16170
LEADBETTER, M. R. N86-16001
LEAN, D. E. N86-15251
LEE, E. P. N86-16085
LEEVSHIN, V. P. N86-15568
LEKAREV, A. V. N86-15886
LEMAITRE, M. P. N86-15753
LEMESHCHENKO, N. A. N86-15868
LERER, A. M. N86-15608
LERER, B. M. N86-15608
LESLIE, F. N86-15770
LEVENTHAL, M. N86-16169
LEVIN, B. M. N86-15574
LEVINGE, R. W. N86-15318
LEVINSKIKH, M. A. N86-15883
N86-15892
LEVITES, A. A. N86-15618
LEVY, M. N86-16127
LEVY, P. W. N86-16170
LEWIS, G. K. N86-16119
LEYMAN, V. G. N86-15592
LEZINA, T. D. N86-15486
LI, S. S. N86-15732
LI, V. O. K. N86-15681
LIANG, E. P. N86-16183
LIANG, W. Q. N86-16000
LIBKIND, V. I. N86-15871
LIKAI, Z. N86-15441
LIKHODED, Y. V. N86-15458
LIKHOSHVAY, I. P. N86-15502
LINCHENG, Z. N86-16003
LINDAU, I. N86-15546
LINDELL, I. V. N86-15535
LINDQVIST, P. A. N86-16177
LINDSAY, D. N86-15516
LINDSTROM, G. N86-15952
LIPPENS, C. N86-15753
LITSOV, A. A. N86-15611
LITTLE, C. B. N86-15341
LIU, J. S. N86-15387
LIVANSKAYA, O. G. N86-15892
LLEWELYN-DAVIES, D. I. T. P. N86-15242
LOCK, R. C. N86-15274
LOGINOV, V. A. N86-15472
LOMAKIN, A. N. N86-15464
LONG, D. E. N86-15740
LONG, E. R., JR. N86-15391
N86-15393
LONG, M. B. N86-16091
LONG, S. A. T. N86-15391
N86-15393
LONGO, E. N86-16072
LOPEZ, J. N86-15322
LORENZ, B. N86-15915
LOSKUTOVA, Y. A. N86-15486
LU, W. J. N86-15547
N86-15548
LUCAS, J. R. N86-16011
LUDINGTON, C. E. N86-15541
LUNDIN, E. N86-16180
LUNGU, T. N86-15410
LURIYE, G. V. N86-15581
LUSIGNOLI, M. N86-16071
LYNCH, N. A. N86-15978
N86-16150
LYUBAVSKAYA, L. A. N86-15580
LYZENGA, D. R. N86-15530

M

MACCALLUM, C. J. N86-16169
MACGORMAN, D. R. N86-15783
MACH, H. N86-15640
N86-15641
MACHULKA, G. A. N86-15469
MACIEJCZYK, J. N86-15869
MACLEAN, L. N86-15817
MACPHERSON, P. B. N86-15648
MADNICK, S. E. N86-16154
MAGAMATSU, T. N86-16107
MAHER, C. N86-16070
MAILYAN, A. L. N86-15504
MAKEYEV, S. N. N86-15604
MAKHVILADZE, G. M. N86-15623
MAKI, M. N86-15696
MAKSIMOV, V. M. N86-15453
MALAKHOV, A. N. N86-15621
MALAKHOVA, G. A. N86-15605
MALONEY, M. P. N86-15952
MAMEDOV, A. K. N86-15497
MANGENG, C. A. N86-15737
MANN, C. J. N86-15762
MANNERSALO, K. N86-15535
MANNING, A. N86-15850
MANSUR, L. K. N86-15355
N86-15356
MANTAY, W. R. N86-15289
MANUILOV, B. D. N86-15459
MARCINIK, E. J. N86-15910
MARCUS, R. A. N86-15860
MARDASHEV, Y. S. N86-15347
MARGETTS, A. D. N86-15853
MARIMONT, Y. I. N86-15495
MARMOLIN, H. N86-15536
MARTIAS, C. N86-16014
MARTIN, B. J. N86-15521
MARTIN, D. W. N86-15785
N86-15797
N86-15822
MARTIN, J. E. N86-15405
MARTYANOV, A. N. N86-15471
MARUYAMA, X. R. N86-16057
MASLOV, V. P. N86-15946
MASLOVETS, F. K. N86-15603
MASON, B. N86-15415
MASONOV, N. N. N86-15578
MASTERSON, K. D. N86-15656
MASUGATA, K. N86-16103
N86-16104
MATHEW, T. N86-16019
MATSON, P. N86-15705
MATSON, R. J. N86-16135
MATSUI, M. N86-16104
MATSUI, T. N86-16022
MATSUKAWA, Y. N86-16105
MATSUZAWA, T. N86-16104
MATTHEWS, M. D. N86-16149
MATVEYEV, Y. N86-15944
MATZKE, H. N86-16075
MAURO, C. A. N86-15899
MAYDINA, V. P. N86-15891
MAYLE, R. N86-16172
MAZUR, P. N86-15862
MCARTHUR, D. J. N86-15966
MCCANDLESS, R. S. N86-15245
MCCOY, D. G. N86-15369
MCDONALD, B. E. N86-15631
MCDONALD, J. E. N86-15430
MCGHEE, R. B. N86-15434
MCGUIRK, J. P. N86-15780
MCKNIGHT, W. B. N86-15666
MCLEOD, J. B. N86-15992
MCMURDIE, H. F. N86-15357
MCNIDER, R. T. N86-15802
N86-15806
N86-15814
MEEKS, E. L. N86-16129
MEHTA, U. N86-15244
MELILHOV, O. I. N86-15623
MENEGHETTI, J. R. N86-16064
MENYAYLENKO, V. V. N86-15490
MENZEL, P. N86-15819
MERTENS, H. W. N86-15905
MERTSALOV, P. P. N86-15346
MIAMEE, A. G. N86-16015
N86-16018
N86-16024
MICHELSEN, C. D. N86-16159
MIDDELKOOP, R. N86-15538
MIFFLIN, R. N86-16005
MIKHNENKO, A. Y. N86-15867
MIKHOVICH, N. S. N86-15613
MILANOVICH, F. P. N86-15756
MILES, P. R. N86-15852
MILLER, H. N86-16079
MILLER, K. N86-15322
MILLER, L. E. N86-15310
MILLER, L. L. N86-15840
MILLER, T. L. N86-15770
N86-15773
MILYUTIN, Y. R. N86-15470
MING-SHENG, H. N86-15301
MINKIN, M. A. N86-15610
MIROSHNIKOVA, Y. B. N86-15873
MIROVITSKIY, D. I. N86-15577
MISHIMA, T. N86-15423
MITASHEV, B. N. N86-15487
MITCHELL, H. G. N86-15760
MITTLEMAN, K. N86-15910
MITTON, S. G. N86-15962
MIURA, K. N86-15421
MIURA, S. N86-15421
MIYAZAKI, T. N86-16114
MIZUI, J. I. N86-16100
N86-16101
MOCKRIDGE, L. N86-15279
MODENA, I. N86-15533
MOLOKOVSKIY, S. I. N86-15590
MOLOTKOV, S. N. N86-15490
MOORE, B. N. N86-15659
MORD, A. J. N86-15334
MORGAN, R. G. N86-15337

MORGUNOV, S. V. N86-15934
MORIYA, T. N86-15695
MORRIS, M. C. N86-15357
MORRIS, N. N86-15337
MORRIS, N. M. N86-15913
MORRISON, G. H. N86-15362
MOSIER, J. N. N86-15954
MOTOYA, Y. N86-15702
MOTUZKO, F. Y. N86-15588
MOURA, A. D. N86-15768
MUENGER, E. A. N86-16185
MULLEN, J. R. N86-15720
MULLER, C. N86-15753
MULLER, P. J. N86-15881
MULLINGS, D. M. N86-16165
MUND, K. N86-15881
MUNIPOV, V. M. N86-15866
MURAVYEVA, G. I. N86-15496
MURIN, D. I. N86-15595
MURRAY, R. W. N86-15400
N86-15401
N86-15556
MUSIKANT, S. N86-16165
MUSTAFINA, L. T. N86-15507
MUZA, S. R. N86-15904
MYKKELTVEIT, S. N86-15761

N

NABIYEV, O. M. N86-15939
NAGLE, R. N. N86-15781
NAKAGAWA, Y. N86-16097
NAKAHAMA, Y. N86-16112
NAKAJIMA, H. N86-15667
NAKANISHI, I. N86-15695
NAKAO, K. N86-15695
NAMAZI, M. N86-15514
NAVRAN, B. H. N86-15305
NAVRATIL, G. A. N86-16122
NAZAROV, V. B. N86-15582
NAZARYAN, A. G. N86-15504
NEFEDOV, I. Y. N86-15605
NEIGHBOURS, J. R. N86-16057
NELSON, R. W. N86-15714
NEMETZ, R. N86-16121
NEURGAONKAR, R. R. N86-16126
NEWMAN, L. A. N86-15662
NICHOLS, F. A. N86-15386
NICKLOW, R. M. N86-16134
NIEBANCK, C. F. N86-15285
N86-15299
NIEDERHOFER, K. H. N86-15540
NIEMI, H. N86-16018
NIETUBICZ, C. J. N86-15636
NIKIFOROV, V. I. N86-15872
NIKOLAYENKO, A. P. N86-15569
NIKOLAYEV, P. V. N86-15609
NISHIDA, K. N86-15425
NITTA, M. N86-15424
NIU, K. N86-16106
N86-16107
N86-16108
N86-16109
N86-16110
N86-16111
N86-16113
NOACK, D. D. N86-16140
NOBRE, C. A. N86-15768
NOBRE, P. N86-15768
NOGAMI, J. N86-15546
NONAKA, H. N86-15426
NORSTRUD, H. N86-15258
NOTESTEIN, J. E. N86-15370
NOVIKOV, G. M. N86-15565
N86-15945
NOVIKOVA, N. D. N86-15884
NOYAN, I. C. N86-15382
NUSINOVICH, G. S. N86-15501
NUYEN, V. N86-15277
NYDERLE, W. N86-15474
NYFORS, E. N86-15717

O

OBRIEN, J. J. N86-15910
OCHS, H. T. N86-15777
OELRICH, I. C. N86-15316
OGASAWARA, M. N86-16112
OGLEVIE, R. E. N86-15338
OGURA, K. N86-15396
OKADA, H. N86-15695
OLEARY, J. J. N86-15303
OLEYNIKOV, A. Y. N86-15605
OLSEN, R. B. N86-15398
OLSON, C. L. N86-16067
OLSON, D. B. N86-15416
OMELYANOVSKIY, E. M. N86-15595
ONO, T. N86-15312
ORGANICK, E. I. N86-15952
ORLOV, V. N. N86-15875
OSANAI, J. N86-15422
OSIPOVA, R. S. N86-15614
OSLUND, L. E. N86-16046
OVSYANNIKOVA, O. B. N86-15592

P

PADUAN, J. V. N86-15847
PAGE, K. R. N86-15859
PALLOTTINO, G. V. N86-15533
PANDA, B. N86-15296
PANDOLF, K. B. N86-15904
PANKRATS, Y. V. N86-15605
PAPAVASSILOPOULOS, G. P. N86-15993
PAQUETTE, R. G. N86-15845
PARANCHICH, L. D. N86-15506
PARANCHICH, S. Y. N86-15506
PARETZKIN, B. N86-15357
PARFENOV, G. P. N86-15881
PARIKH, P. N86-15412
PARKER, H. S. N86-15357
PARKER, K. G. N86-15815
N86-15817
PARKHOMENKO, A. I. N86-15599
PARRISH, J. N86-15309
PARROTT, T. L. N86-16040
PARTHASARATHY, S. P. N86-15249
PASCUT, M. N86-15409
PASHAYEV, A. M. N86-15491
PASHIN, S. S. N86-15890
PASHKIN, V. M. N86-15488
PATERSON, M. S. N86-15955
PATTERSON, E. L. N86-16067
PAULL, A. N86-15337
PAULSON, C. A. N86-15847
PAVELYEV, A. G. N86-15562
PEARSON, A. E. N86-15999
PEELLE, R. W. N86-16062
PEGGION, G. N86-15751
PELITI, L. N86-16146
PELLEGRINI, P. W. N86-15541
PELYUSHENKO, S. A. N86-15511
PEPPER, M. N86-15549
PERKEY, D. J. N86-15801
PERRY, F. C. N86-16140
PERRY, R. B. N86-16083
PERVOVA, L. V. N86-15595
PESARAN, A. N86-15736
PETERS, D. A. N86-15293
N86-15301
PETERSON, V. L. N86-15626
PETRASEK, D. W. N86-15378
PETRICHENKO, V. F. N86-15599
PETRIE, G. M. N86-15703
PETROV, B. I. N86-15613
PETROV, B. M. N86-15456
PETRUNKIN, Y. Z. N86-15565
PETTINI, M. N86-16010
PETTITT, D. R. N86-16176
PFERDNER, R. N86-15327
PFEUFER, G. W. N86-16160
PICKERING, E. W., JR. N86-15390
PIERCE, R. D. N86-16052
PIETRZAK-FLIS, Z. N86-15895
PIKE, C. D. N86-16064
PILLAI, S. U. N86-15520
PIMENOV, Y. V. N86-15462
PINSKI, F. J. N86-16035
PIZZELLA, G. N86-15533
PLATONOV, N. I. N86-15612
PLOKHOVA, L. A. N86-15618
PODLEPETSKIY, B. I. N86-15493
PODOLYAKO, G. M. N86-15624
POGREBNYAK, A. D. N86-15509
POISSON-QUINTON, P. N86-15272
POLANYI, J. C. N86-15661
POLLARD, R. T. N86-15851
POLONNIKOV, D. Y. N86-15492
POLOVINKIN, A. V. N86-15513
POMPHREY, P. J., JR. N86-16087
PONOMARENKO, V. I. N86-15577
PONOMAREV, L. I. N86-15457
N86-15458
N86-15460
PONOMARVE, S. I. N86-15614
POOCK, G. K. N86-15521
POPOV, A. S. N86-15461
PORTER, F. N86-15769
POSPELOV, E. M. N86-15940
POUKEY, J. W. N86-16067
POURAHMADI, M. N86-16015
POWELL, R. W. N86-15384
POYER, M. E. N86-15334
POZDEYEV, A. D. N86-15598
PRABHU, R. N86-15241
PREISSER, J. S. N86-16041
PRIEDHORSKY, W. N86-16184
PRINZ, F. B. N86-16004
PRITCHARD, R. S. N86-16050
PROKHOROV, A. M. N86-15595
PROSCHAN, F. N86-16013
PUGOVKIN, A. V. N86-15622
PURDOM, J. F. W. N86-15809
PURPURA, P. T. N86-15651

Q

QIHONG, L. N86-15482
QUINN, B. N86-16070

R

RADWAN, I. N86-15895
RAKITIN, S. V. N86-15509
RAMRAS-BERLIN, S. D. N86-16153
RAO, M. B. N86-16019
RAPAGNANI, P. N86-15533
RAVNYAGO, S. K. N86-15929
RAYKHSHTEYN, V. I. N86-15595
READER, K. R. N86-15298
REAVIS, N. N86-15817
REDDY, T. S. R. N86-15295
REED, D. N86-15300
REEDY, R. C. N86-16170
REGAN, D. N86-15907
REID, L. D. N86-15911
REINERS, W. N86-15705
REITTER, T. N86-15399
RENLUND, A. M. N86-15419
RESHETNYAK, V. N. N86-15931
REUBUSH, D. E. N86-15248
REYNOLDS, H. N86-15770
RICCI, F. N86-15533
RICHARDSON, M. N86-15957
RICKS, R. N86-15300
RIDDELL, F. R. N86-15316
RIEDESEL, M. A. N86-15750
RIES, H. R. N86-15391
N86-15393
RITCHIE, R. H. N86-16063
ROACHE, P. J. N86-16002
ROBERTS, B. N86-15309
ROBERTS, G. O. N86-15773
ROBERTSON, F. R. N86-15775
N86-15794
ROBINSON, D. M. N86-16089
ROBINSON, J. A. N86-15950
ROBINSON, P. I. N86-15336
ROGERS, M. E. N86-15663
ROMANOV, V. V. N86-15938
ROOF, R. B. N86-16136
ROSE, G. N86-15766
ROSE, J. H. N86-16051
ROSENBLUTH, M. N. N86-15659
ROSENKRANTZ, W. A. N86-15529
ROSS, A. N86-15279
ROTH, R. N86-15838
ROTHERMAL, J. N86-15792
ROTT, N. N86-16032
N86-16034
ROUSE, W. B. N86-15913
ROUSSIN, R. W. N86-16161
ROVINSKIY, A. P. N86-15485
ROWE, V. N86-15332
ROZENBLYUM, L. A. N86-15887
ROZENDAAL, R. A. N86-15305
RUD, S. V. N86-15453
RUMBLE, S. J. N86-16049
RUNYAN, H. L. N86-15287
RUNYAN, L. J. N86-15305
RUQING, Z. N86-16148
RUSHTON, A. M. N86-16144
RUSSELL, R. D. N86-15903
RUST, W. D. N86-15783
RUTHER, W. E. N86-15386
RYAZANOV, V. D. N86-15608
RYBAKOV, B. S. N86-15566
RYZHIY, V. I. N86-15616

S

SACHER, P. N86-15263
SADOVNIKOV, A. D. N86-15487

SADREDDINI, S. M. N86-15674
SAFA, M. M. A. N86-15648
SAFIULLIN, N. Z. N86-15594
SAI, E. N86-16103
SAICHEV, A. I. N86-15513
SAKHAVAT, H. N86-15711
SAKOU, H. N86-15424
SAKURABA, I. N86-15423
SALAKH, A. K. N86-15462
SALAMA, K. N86-15680
SALHOTRA, A. N86-15733
SALZMAN, B. N86-15781
SAMEJIMA, F. N86-15914
SAMOFALOV, K. G. N86-15929
SAMRATOVA, S. V. N86-15880
SANDERS, J. A. N86-15734
SANDLER, M. S. N86-15573
SANTINI, P. M. N86-16030
SARABER, M. J. M. N86-15857
SARAYDIN, A. N86-15965
SARIC, W. S. N86-15268
N86-15269
SAROHIA, V. N86-15412
SASATANI, T. N86-15695
N86-15701
SATO, M. N86-16100
N86-16101
N86-16106
SATOH, T. N86-15422
SATTAROV, D. K. N86-15508
SATTI, J. A. N86-16078
SAUNDERS, P. M. N86-15850
SAUTTER, F. C. N86-15308
SAVITSKIY, A. I. N86-15940
SAVITSKIY, G. V. N86-15597
SAWKA, M. N. N86-15904
SAWYER, B. E. N86-15545
SAZONOV, N. A. N86-15575
SCHAEFER, B. N86-15643
SCHAEFER, H. J. N86-15639
N86-15668
SCHEIN, D. B. N86-16040
SCHEUERMAN, C. M. N86-15380
SCHISSEL, P. N86-15656
SCHLESINGER, R. N86-15810
SCHMITT, F. N86-16038
SCHNEIDER, L. X. N86-16125
SCHOOF, C. N86-15688
N86-15689
SCHOWENGERDT, R. N86-15710
SCHREYER, H. L. N86-15432
SCHROEDER, M. A. N86-15368
SCHROTH, J. G. N86-15376
SCHULTHEISS, P. J. N86-15855
SCHULTZ, K. N86-15736
SCHUSTER, G. B. N86-15341
N86-15342
SCHWARZ, A. C. N86-15418
SCHWEIKHARD, W. G. N86-15323
SCOTT, G. W. N86-16156
SCOTT, M. H. N86-15685
SCRIBNER, K. J. N86-15417
SEAGRAVES, P. N86-16180
SEGAL, G. I. N86-16073
SEILER, F. N86-15252
SEINSTRA, S. N86-15676
SEKULER, R. N86-15906
SELLERS, C. E. N86-15827
SEMENIKHIN, A. I. N86-15456
SEMENOV, V. M. N86-15579
SENKEVICH, Y. A. N86-15880
SENUM, G. I. N86-15743
SEREBRANKOW, E. N86-15896
SERVA, M. N86-16147
SEYDOUX, J. N86-16070
SHABLOVSKIY, V. M. N86-15459
SHAFER, D. F. N86-16159
SHALAGINOV, Y. V. N86-15935
SHAMASHOV, M. A. N86-15934
SHANKLE, K. R. N86-15433
SHAOYING, Z. N86-15483
SHARMA, P. K. N86-15360
SHATALOV, A. V. N86-15460
SHCHERVAKOV, Y. A. N86-15495
SHEEDY, J. F. N86-15528
SHELDON, L. S. N86-15358
SHELPUK, B. N86-15735
SHEPHERD, F. D., JR. N86-15541
SHEPOSH, J. P. N86-16153
SHERMAN, G. E. N86-15922
SHERRICK, T. M. N86-15961
SHERWOOD, G. E. N86-15431
SHETTY, B. N86-16028
SHIBUKAWA, A. N86-15731
SHIDLOVSKAYA, T. Y. N86-15876
SHILIN, L. Y. N86-15505
SHIMADA, H. N86-15371
SHIMAMURA, H. N86-15695
SHIMOTORI, Y. N86-16103
SHINDEL, H. L. N86-15719
SHIPOV, A. A. N86-15878
SHIRER, H. N. N86-15776
SHLAYN, A. I. N86-15495
SHMID, O. I. N86-15604
SHPERNYI, A. V. N86-15624
SHUCHMAN, R. A. N86-15530
SHUKHOSTANOV, A. K. N86-15597
SHUMKOV, Y. M. N86-15941
SHUVALOV, M. Y. N86-15468
SHVETS, V. N. N86-15877
SIBERT, E. E. N86-15950
SIDOROVYY, M. N86-15930
SIEGMUND, D. N86-16025
SIGNOR, D. B. N86-15243
SIHVOLA, A. N86-15715
N86-15717
SILVER, G. L. N86-15969
SIMCHIK, R. J., JR. N86-15557
SIME, D. N86-16180
SIME, D. G. N86-16179
SIMOICH, D. M. N86-15754
SIMONOV, L. G. N86-15887
SIMPSON, B. N86-15306
SIMPSON, J. E. N86-15542
SIMPSON, R. L., JR. N86-15912
SIMPSON, W. G. N86-15720
SINGNOI, W. N. N86-15323
SINHA, B. K. N86-16020
SIRE, R. N86-15688
N86-15689
SISAK, W. J. N86-15375
SKEDZIELEWSKI, S. N86-15975
SKOLAUT, M. W., JR. N86-16089
SLEDKOV, V. A. N86-15608
SLUNGA, R. N86-15765
SMETANIN, A. I. N86-15618
SMIGIELSKI, P. N86-15657
SMIRNOV, A. Y. N86-15605
SMIRNOV, S. V. N86-15465
SMITH, D. E. N86-15899
SMITH, J. H. B. N86-15264
SMITH, M. S. N86-15330
SMITH, P. J. N86-15778
SMITH, R. E. N86-15800
SMITH, R. W. N86-15374
SMITH, S. L. N86-15954
SMITH, W. N86-15819
SMITH, W. L. N86-15805
SMOLNIKOV, V. A. N86-15932
SNAUFER, J. B. N86-15951
SNIGIREV, O. V. N86-15619
SNYDER, D. D. N86-16057
SNYDER, H. A. N86-15334
SOHN, J. K. N86-16021
SOKHOLOV, G. A. N86-15510
SOKOLOVA, I. V. N86-15889
SOLOMIN, G. I. N86-15890
SOLOMON, H. N86-15989
SOMA, N. Y. N86-15983
N86-15984
SONDERGELD, K. P. N86-15677
SONG, S. M. N86-15434
SOPHER, R. N86-15291
SOULSBY, R. L. N86-15854
SPARROW, J. G. N86-16049
SPASYUK, A. M. N86-15488
SPENCER, R. W. N86-15797
N86-15799
N86-15821
SPERGEL, M. S. N86-16170
SPICER, W. E. N86-15546
SPRANGLE, P. N86-16115
SROKOSZ, M. A. N86-15853
SRULIJES, J. N86-15252
STAFSUDD, O. M. N86-16130
STALKER, R. J. N86-15337
STANEWSKY, E. N86-15275
STANISLAWSKI, J. N86-15896
STAPLETON, G. E. N86-16084
STAROSELSKIY, V. I. N86-15489
STAUDHAMMER, K. P. N86-15385
STAUNTON, J. N86-16035
STECKL, A. J. N86-15547
N86-15548
STEINHAUSER, R. N86-15329
STELMAKH, M. F. N86-15469
STENNER, R. D. N86-16155
STEPANOVA, M. N. N86-15614
STEPHENS, J. R. N86-15380
STERN, F. N86-15633
STEVERDING, B. N86-16068
STEWART, D. A. N86-15335
STEWART, L. L. N86-15719
STEWART, R. E. N86-16095
STIASSNIE, M. N86-15635
STOCKS, G. M. N86-16035
N86-16080
STODDARD, I. A. N86-15911
STORM, D. W. N86-16124
STOUT, R. B. N86-15638
STRAUB, F. K. N86-15281
STRAUB, G. N86-16138
STREBY, G. D. N86-15923
STREETS, D. G. N86-15742
N86-15744
STROHM, W. W. N86-16083
STRONG, L. N86-15705
STRUCHEEV, V. F. N86-15568
SU, C. C. N86-15625
SUBRAMANYAM, K. N86-16019
SUGAVANAM, A. N86-15273
SUKHAREV, I. G. N86-15453
SUKHOVA, N. I. N86-15883
SULIMA, O. V. N86-15615
SULIN, L. I. N86-15938
SULTAN, M. I. N86-15746
SUMMERS, C. J. N86-16129
SUOMI, V. E. N86-15816
SUPONKO, K. L. N86-15346
SUTIN, N. N86-15860
SUZUKI, S. N86-15702
SVETZ, F. J. N86-15826
SVISTUNOV, K. V. N86-15572
SVOB, G. J. N86-15411
SWENSON, G. R. N86-15755
SWIATECKI, W. J. N86-16066
SYKES, M. N86-15308
SYSOYEV, B. I. N86-15485
SZYMANSKI, J. N86-16070

T

TAGUCHI, M. N86-16114
TAI, H. N86-15287
TAIRBEKOV, M. G. N86-15881
TAKAHASHI, A. N86-16104
TAKAHASHI, T. N86-15422
N86-16098
TAKEUCHI, K. N86-15698
N86-15699
TALBERT, W. L., JR. N86-16173
TALNYKIN, E. A. N86-15937
N86-15942
TAMHANKAR, S. S. N86-15360
TANG, C. M. N86-15781
TANG, D. M. N86-15284
TANIGUCHI, T. N86-15696
N86-15697
TARASOV, Y. N. N86-15580
TEHRANI, M. M. N86-16128
TERELAK, J. N86-15869
TERRES, R. R. N86-15747
THAYER, G. R. N86-15737
THIESSEN, J. W. N86-16084
THOMAS, A. S. N86-15267
THOMAS, J. N86-15688
N86-15689
THOMAS, J. O. N86-15664
THOMAS, R. G. N86-16084
THOMAS, R. L. N86-15650
THOMAS, S. D. N86-15246
THOMPSON, A. H. N86-15780
THUMTRAKUL, W. N86-15843
TIEJIAN, Y. N86-15442
TIMMER, E. N86-15560
TININ, M. V. N86-15572
TISHCHENKO, Y. G. N86-15466
TITRAN, R. H. N86-15380
TIURI, M. N86-15716
N86-15717
TIWARI, S. N. N86-15395
TOKI, S. N86-15421
TOLER, C. G. N86-15328
TOLSTOV, Y. F. N86-15575
TOMBESI, P. N86-16094
TOMERAASEN, P. L. N86-15647
TOOMRE, J. N86-15772
TOPOROV, Y. P. N86-15613
TREVES, A. N86-16145
TRINH, T. T. N86-16153
TROTT, W. M. N86-15419
TRUBITSYN, A. V. N86-15588
TSANG, C. F. N86-15637
TSEYUKOV, V. N86-15947
TSIKIN, B. G. N86-15593
TSONG, I. S. T. N86-15361
TSUKANO, Y. N86-15312

TSUNODA, Y. N86-16134
TSUO, Y. S. N86-16135
TSURUKI, M. N86-16111
TSUTSUI, H. N86-16114
TSVILEV, G. I. N86-15614
TU, P. K. C. N86-15738
TUTTLE, T. C. N86-16149

U

UEUNTEN, R. H. N86-16073
UFFORD, R. P. N86-15964
ULADINOV, A. B. N86-15469
ULMAN, J. D. N86-15925
ULYATOVSKIY, N. V. N86-15872
UPFAL, E. N86-15988
URBACH, A. R. N86-15334
URUSOV, I. D. N86-15502
USANOV, D. A. N86-15611
USHAKOV, A. S. N86-15873

V

VAGARIN, A. Y. N86-15611
VAKULENKO, V. M. N86-15498
VANDERWALLE, M. A. G. N86-16026
VANECEK, D. L. N86-16064
VANES, H. R. N86-15537
VANRYSWYK, H. N86-15552
VASIN, L. I. N86-15508
VAUGHAN, O. H., JR. N86-15787
VAUGHAN, W. W. N86-15769
VAZ, A. M. Z. N86-16178
VECCHIO, R. S. N86-15372
VENEMA, A. N86-15649
VENKATESAN, C. N86-15294
VERCHEVAL, J. N86-15753
VERNET, J. E. N86-15744
VESELKA, T. D. N86-15744
VESELOV, G. I. N86-15612
VILINSKIY, Y. S. N86-15929
VINCENT, D. G. N86-15779
VINKE, J. N86-15858
VINOKHODOVA. T. V. N86-15875
VITTITOE, C. N. N86-15517
VIVIAND, H. N86-15262
VLAHOS, L. N86-16115
VLASOV, V. D. N86-15871
VLASOVA, T. F. N86-15873
VNUKOVA, Z. Y. N86-15877
VOLVACH, S. I. N86-15872
VONDERHAAR, T. H. N86-15809
VONNEGUT, B. N86-15787
VONWINKLE, W. A. N86-15630
VORONIN, L. I. N86-15872
VORONKOV, V. V. N86-15595
VORONKOVA, G. I. N86-15595
VOSKRESENSKIY, D. I. N86-15453
VROEGOP, P. H. N86-15675
VUJAKLIJA, M. N86-16057
VULPIANI, A. N86-16010
VYAZOVA, Y. P. N86-15879

W

WAAS, A. M. N86-15348
WADSWORTH, J. N86-15381
WAGNER, C. A. N86-15632
WAGNER, J. D. N86-15847
WAI, J. N86-15627
WAITZ, A. N86-16116
WALDNER, C. N86-15476
WALDRON, K. J. N86-15434
WALLACE, D. C. N86-16036
WALLACE, J. N86-15306
WANDELL, B. A. N86-15898
WANG, Y. R. N86-16154
WANGLER, T. P. N86-16065
WANKE, G. N86-15881
WARMBRODT, W. N86-15281
N86-15295
WARWICK, A. I. N86-16064
WASHBURN, D. K. N86-16155
WATERS, R. C. N86-15948
WATKINS, C. B. N86-15298
WATTS, B. J. N86-15309
WAXMAN, A. M. N86-15901
WAYMAN, J. L. N86-15527
WEATHERHEAD, D. C., JR. N86-15740
WEAVER, C. H. N86-15523
WEAVER, T. A. N86-16172
N86-16174
WEBER, W. J. N86-16075
WEEKS, M. M. N86-15541
WEI, F. S. N86-15290
WEIDERT, M. T. N86-15531
WEIDHUNER, D. D. N86-15316
WEINACHT, P. N86-15636
WEINER, M. M. N86-15525
WEISS, R. N86-15477
WELCOME, M. N86-15975
WELLMAN, B. N86-15304
WERNER, M. D. N86-15367
WEST, B. J. N86-15682
WEST, G. S. N86-15800
WESTFALL, L. J. N86-15378
WETTE, M. N86-15970
WHEELER, T. G. N86-15859
WHEELER, W. K. N86-15686
WHITE, J. E. N86-16161
WHITE, K. J. N86-15369
WIEFLING, K. N86-15415
WIGDERSON, A. N86-15988
WILKINS, R. L. N86-16073
WILKINSON, C. L. N86-15339
WILKINSON, R. E. N86-16149
WILLEKE, F. N86-16077
WILLIAMS, M. D. N86-15658
WILLIAMS, S. F. N86-15814
WILLSON, J. P. N86-15515
WILSON, G. S. N86-15798
N86-15806
N86-15817
N86-15819
WILSON, J. R. N86-16172
WILSON, S. L. N86-15342
WILT, M. J. N86-15637
WITTING, J. M. N86-15631
WOIZENKO, E. N86-15864
WOJCIECHOWSKI, S. N86-16007
WONG-NG, W. N86-15357
WONG, H. V. N86-15659
WOOD, C. W. N86-15315
WOOSLEY, S. E. N86-16172
N86-16174
WRIGHT, T. W. N86-15670
WRIGHTON, M. S. N86-15553
WU, C. K. N86-15839
WU, C. T. N86-15373
WUKELIC, G. E. N86-15703
WULF, G. N86-15683
WURDEN, G. A. N86-16120
WYANT, F. J. N86-15407
WYSOR, M. S. N86-15897

X

XIANYU, S. N86-15483
XINGWU, M. N86-15441
XUAN, Z. N86-15481

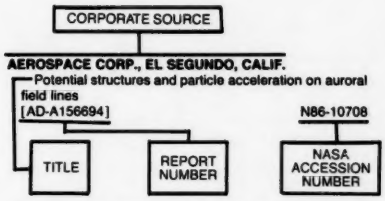
Y

YAKIMOV, A. V. N86-15573
YAKOVER, I. M. N86-15609
YAMADA, Y. N86-16102
YAMAGUCHI, M. N86-15731
YAMAMOTO, S. N86-15731
YANASSE, H. H. N86-15983
N86-15984
YANO, S. N86-16099
YAO, A. R. N86-15693
YAREMENKO, Y. I. N86-15470
YASHIMA, Y. N86-15396
YASHIN, A. A. N86-15620
YATSKEVICH, V. A. N86-15454
YATSUI, K. N86-16096
N86-16103
YAVROUIAN, A. N86-15412
YEAGER, W. T., JR. N86-15289
YEGOROV, B. N86-15615
YEH, C. C. N86-15520
YEROFEYEV, B. V. N86-15347
YEW, M. K. N86-15980
YOKOYAMA, I. N86-15695
YOKOYAMA, M. N86-16102
YONEDA, H. N86-16098
YONEZU, H. N86-16100
N86-16101
YONGGUO, L. N86-15483
YONGZIAO, Y. N86-16148
YOSHARA, H. N86-15265
YOSHIHARA, H. N86-15257
YOSHIHIRO, M. N86-15697
YOUNG, A. J. N86-15904
YOUNG, J. T. N86-15816
YOUNG, K. G. N86-15973
YUHTA, T. N86-15422
YUNUSOV, M. A. N86-15875
YUNUSOVA, L. S. N86-15882
YUQIN, L. N86-15480

Z

ZAFT, M. P. N86-15590
ZAGIDULLIN, K. K. N86-15939
ZAHARESCU, M. N86-15409
ZAKHARNEV, A. P. N86-15496
ZALESAK, S. T. N86-15760
ZALOGUYEV, S. N. N86-15884
ZAPATA, L. N86-15658
ZAPEVALOV, V. Y. N86-15501
ZAYENTSEV, V. V. N86-15610
ZHERIKHIN, N. V. N86-15510
ZHIZHENKOVA, L. N. N86-15488
ZHONG, R. M. N86-15382
ZIMMERMAN, R. S. N86-15349
ZIXIAO, W. N86-15439
ZORIN, A. B. N86-15617
ZUBAREV, Y. B. N86-15494
ZWELLING, L. A. N86-15897

Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The NASA accession number denotes the number by which the citation is identified. The titles are arranged under each corporate source in ascending accession number order.

A

ADVANCED ENGINEERING LAB., SALISBURY (AUSTRALIA).
Flutter generator control and force computer
[AEL-0242-TM] N86-15318

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, NEUILLY-SUR-SEINE (FRANCE).
Test cases for inviscid flow field methods
[AGARD-AR-211] N86-15256
Aircraft Drag Prediction and Reduction
[AGARD-R-723] N86-15266

AEROCHEM RESEARCH LABS., INC., PRINCETON, N. J.
Fuel effects on soot formation in turbojet engines
[AD-A159073] N86-15416

AERODYNE RESEARCH, INC., BILLERICA, MASS.
Outer product calculations
[AD-A158295] N86-15991

AERONAUTICAL RESEARCH LABS., MELBOURNE (AUSTRALIA).
An optimisation method for reconstruction of flight path trajectories from non-synchronous time-sampled observations by two cine cameras
[ARL-SYS-R-34] N86-15279
The airlift dilemma: An update
[AD-A159307] N86-15353
Ultrasonic transit time measurements using fast analog to digital conversion and a fast fourier transform based algorithm
[AD-A159426] N86-16049

AEROSPACE CORP., EL SEGUNDO, CALIF.
Theoretical model of Hg(1-x)Cd(x)Te photovoltaic and photoconductive infrared detectors
[AD-A158668] N86-15551
The charge-state composition of 0.4-MeV helium ions in Earth's outer radiation belts during quiet times
[AD-A147561] N86-15757
The parameters of adiabatic rapid passage in the 0-0 hyperfine transition of Rb-87
[AD-A158562] N86-16056
Material shields against neutral atomic particle beams
[AD-A159445] N86-16058
In search of high J states in the HF(v, J) system
[AD-A158937] N86-16073
Comparison of 2D memory SEU transport simulations with experiments
[DE85-016134] N86-16137

AEROSPACE MEDICAL RESEARCH LABS., WRIGHT-PATTERSON AFB, OHIO.
Programming a multiple-orifice hydraulic decelerator
[AD-A159428] N86-15328

AIR FORCE ACADEMY, COLO.
United States Air Force Academy, Department of Chemistry Research: AY 1983-1984
[AD-A159319] N86-15343
Number of targets threatened simultaneously (NOTTS) in conjunction with over the horizon back-scatter (OTHB) radar coverage
[AD-A159304] N86-15528

AIR FORCE ENGINEERING AND SERVICES CENTER, TYNDALL AFB, FLA.
Development of packed-tower air strippers for trichloroethylene removal at Wurtsmith Air Force Base, Michigan
[AD-A159139] N86-15326

AIR FORCE ENVIRONMENTAL TECHNICAL APPLICATIONS CENTER, SCOTT AFB, ILL.
Kitzingen AI, Germany limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159604] N86-15829
AL Jubayl/Dhahran, Saudi Arabia limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159605] N86-15830
Dakar senegal limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159606] N86-15831
Tahiti Island Pacific limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159607] N86-15832
Pirmasens AHP DL, West Germany limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159608] N86-15833
Revised Uniform Summary of Surface Weather Observations (RUSSWO). Parts A-F Fort Belvoir/Davison AAF, Virginia
[AD-A159609] N86-15834
Yongsan Reservation, Korea limited surface observations climatic summary (LISOCS). Parts A, c-f
[AD-A159610] N86-15835

AIR FORCE FLIGHT DYNAMICS LAB., WRIGHT-PATTERSON AFB, OHIO.
Aircraft flight performance methods. Revision 2
[AD-A158227] N86-15310

AIR FORCE GEOPHYSICS LAB., HANSCOM AFB, MASS.
A conceptual model of the severe-storm environment for inclusion into Air Weather Service severe-storm analysis and forecast procedures
[AD-A158010] N86-15824

AIR FORCE INST. OF TECH., WRIGHT-PATTERSON AFB, OHIO.
Analysis of the effects of transient heat transfer on axial flow compressor blade boundary layers
[AD-A158094] N86-15315
Use of hinged strakes for lateral control at high angles of attack
[AD-A158005] N86-15321
Concepts for the development of a nondestructive testing and evaluation system for rigid airfield pavements
[AD-A158004] N86-15324
Time-resolved flowfield measurements in a turbine stage
[AD-A158092] N86-15634
Modal analysis of unstable resonators
[AD-A159225] N86-15663
Validation of outgoing longwave radiation in the GLAS (Goddard Laboratory for Atmospheric Sciences) general circulation model
[AD-A158006] N86-15823
A synoptic and mesoscale study of a frequent lightning event
[AD-A158225] N86-15825
The Middle Latency Response (MLR) and Steady State Evoked Potential (SSEP) in neonates
[AD-A158007] N86-15900
Comparison of the Air Force female and male pilot grounded time in the Air Force Military Airlift Command
[AD-A158093] N86-15902
A computer model of case-based reasoning in problem solving: An investigation in the domain of dispute mediation
[AD-A158097] N86-15912
Practical guidelines for testing Ada programs
[AD-A158099] N86-15951
Can aircraft noise less than or equal 115 to dBA adversely affect reproductive outcome in USAF women?
[AD-A158322] N86-16045

AIR FORCE ROCKET PROPULSION LAB., EDWARDS AFB, CALIF.
Acoustical imaging system evaluation
[AD-A159425] N86-15684

AIR FORCE SYSTEMS COMMAND, WRIGHT-PATTERSON AFB, OHIO.
Elastic bearing
[AD-A159140] N86-15672
Brief introduction to the Soviet Central Research Institute of Aerodynamics
[AD-A159103] N86-16148

AIR FORCE WRIGHT AERONAUTICAL LABS., WRIGHT-PATTERSON AFB, OHIO.
Effects of chemistry and processing on the fracture related properties of P/M alloy CT91
[AD-A159299] N86-15383

ALABAMA UNIV., HUNTSVILLE.
Multi-dimensional combustion instability analysis of solid propellant rocket motors
[AD-A158314] N86-15414
Plasmas as light sources for lasers
[AD-A159460] N86-15666
Preliminary planning for the Satellite Precipitaion And Cloud Experiment (SPACE) field program N86-15814

ALLIED BENDIX AEROSPACE, KANSAS CITY, MO.
Microstructural evaluation of 49Co-49Fe-2V alloy
[DE85-016500] N86-15388

AMAF INDUSTRIES, COLUMBIA, MD.
Research and development of an aimed magnetic lead current density-magnetic field diagnostic
[DE85-014720] N86-16060

AMES LAB., IOWA.
Probabilistic analysis of steel containment strength with internal pressure
[DE85-015520] N86-15389
Ultrasonic characterization of porosity using the Kramers-Kronig relations
[DE85-017346] N86-16051
Electronic structure of rare Earth metals and intermetallics
[DE85-015523] N86-16139

ARGONNE NATIONAL LAB., ILL.
The role of hydrogen embrittlement in intergranular stress corrosion cracking of sensitized type 304 stainless steel
[TI85-014965] N86-15386
Controlling acidic deposition: Targeted strategies for reducing sulfur dioxide emissions
[DE85-015058] N86-15742
Proposals for acid-rain control from the 98th Congress
[DE85-015268] N86-15744
Performance of various computers using standard linear equations software in a FORTRAN environment
[DE85-015338] N86-15974
Superconducting linacs: Some recent developments
[DE85-014972] N86-16061
Demonstration of the in-field use of calorimetric assay for IAEA inspection purposes
[DE85-016448] N86-16063
ANL/Star Project: A new architecture for large scale theoretical physics computations
[DE85-014988] N86-16144

ARIZONA STATE UNIV., TEMPE.
Boundary-layer transition: T-S waves and crossflow mechanisms N86-15268
Laminar flow control with suction: Theory and experiment N86-15269
Mechanisms of excitation and ionization processes in sputtering
[AD-A158061] N86-15361
Heat transfer characteristics within an array of impinging jets. Effects of crossflow temperature relative to jet temperature
[NASA-CR-3936] N86-15625

ARIZONA UNIV., TUCSON.
LANDSAT-4 Thematic Mapper Modulation Transfer Function (MTF) evaluation
[E86-10017] N86-15710
ARMY AVIATION SYSTEMS COMMAND, MOFFETT FIELD, CALIF.
Experimentally determined flutter from two- and three-bladed model bearingless rotors in hover
N86-15286
ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
Repair, evaluation, maintenance, and rehabilitation research program. The condition of Corps of Engineers civil works concrete structures
[AD-A157992] N86-15430
Spring stiffnesses for beam-column analysis of soil-structure interaction problems
[AD-A158072] N86-15690
ARMY ENVIRONMENTAL HYGIENE AGENCY, ABERDEEN PROVING GROUND, MD.
Topical hazard evaluation program of Candidate Insect repellent AI3-35770 Hexahydro-1-((2-Methylcyclohexyl) Carbonyl)-1-H-Azepine
[AD-A158386] N86-15903
ARMY MILITARY PERSONNEL CENTER, ALEXANDRIA, VA.
A model of an expert computer vision and recognition facility with applications of a proportion technique
[AD-A158073] N86-15922
ARMY RESEARCH INST. FOR THE BEHAVIORAL AND SOCIAL SCIENCES, ALEXANDRIA, VA.
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[AD-A158316] N86-15916
ARMY RESEARCH INST. OF ENVIRONMENTAL MEDICINE, NATICK, MASS.
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[AD-A158871] N86-15904
ARMY TRAINING AND DOCTRINE COMMAND, FORT MONROE, VA.
Light helicopter family trade-off analysis. Volume 4: Appendix N
[AD-A158075] N86-15306
Light helicopter family trade-off analysis. Volume 7: Appendix R
[AD-A158076] N86-15307
Light helicopter family trade-off analysis. Volume 8: Appendices S and T
[AD-A158077] N86-15308
Light helicopter family trade-off analysis. Volume 10: Appendices V, W, X, and Z
[AD-A158079] N86-15309
AUSTIN RESEARCH ASSOCIATES, INC., TEX.
Theoretical studies of two-dimensional effects in free electron lasers
[AD-A158229] N86-15659

B

BALL AEROSPACE SYSTEMS DIV., BOULDER, COLO.
BASD: SIRTF Telescope Instrument Changeout and Cryogen Replenishment (STICCR) study
[NASA-CR-177381] N86-15334
BALLISTIC RESEARCH LABS., ABERDEEN PROVING GROUND, MD.
Critical analysis of nitramine decomposition data: Product distributions from HMX and RDX decomposition
[AD-A159325] N86-15368
Flash X-ray with image enhancement applied to combustion events
[AD-A159328] N86-15369
Wave motion analysis of a nonspinning liquid filled cylinder
[AD-A159324] N86-15636
Steady state penetration of rigid perfectly plastic targets
[AD-A158081] N86-15670
Color post-processor for the EPIC-2 computer program
[AD-A159321] N86-15961
BELL TELEPHONE LABS., INC., MURRAY HILL, N. J.
Search for positron annihilation line and continuum radiation from the Galactic Center
[DE85-013964] N86-16169
BERKELEY RESEARCH ASSOCIATES, INC., CALIF.
Research on intense electron beams and applications
[AD-A158234] N86-16055
BOEING AEROSPACE CO., SEATTLE, WASH.
Space station propulsion requirements study
[NASA-CR-174934] N86-15339
BOEING COMMERCIAL AIRPLANE CO., SEATTLE, WASH.
F-111 natural laminar flow glove flight test data analysis and boundary layer stability analysis
[NASA-CR-166051] N86-15305
BOEING MILITARY AIRPLANE DEVELOPMENT, SEATTLE, WASH.
Objectives and scope of the Working Group 07
N86-15257
Concluding remarks N86-15265
BOEING VERTOL CO., PHILADELPHIA, PA.
Parametric study of the aeroelastic stability of a bearingless rotor N86-15283
Restructuring the rotor analysis program C-60
N86-15292
Planning, creating and documenting a NASTRAN finite element model of a modern helicopter N86-15300
BOLT, BERANEK, AND NEWMAN, INC., CAMBRIDGE, MASS.
A fault tolerant system for an integrated avionics sensor configuration
[NASA-CR-3834] N86-15278
BRISTOL UNIV. (ENGLAND).
First-principles calculation of the magnetic properties of paramagnetic fcc iron
[DE85-017155] N86-16035
Self-consistent electronic structure of alpha-phase Hume-Rothery electron compound
[DE85-017560] N86-16080
BRITISH BROADCASTING CORP., KINGSWOOD (ENGLAND).
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[BBC-RD-1985/9] N86-15515
BRITISH LIBRARY LENDING DIV., BOSTON SPA (ENGLAND).
The movement of a cluster of particles subject to the effect of gravity and their sedimentation onto a plane horizontal surface
[BLL-RISLEY-TR-51[illegible]-(9091.9F)] N86-15623
Research into heat transfer by convection in the chamber of a furnace with relation to the angle at which a high velocity jet strikes a plane surface
[BLLD-M-36478-(5828.4)] N86-15624
BROOKHAVEN NATIONAL LAB., UPTON, N. Y.
Capabilities, needs and applications of gaseous tracers
[DE85-015194] N86-15743
Application of electron-transfer theory to several systems of biological interest
[DE85-015835] N86-15860
Mean fission neutron spectrum energies for (252) Cf and fissile nuclides, (233)U, (235)U, (239)Pu and (241)Pu
[DE85-013298] N86-16086
BROWN UNIV., PROVIDENCE, R. I.
Control and identification of time varying systems
[AD-A159067] N86-15999

C

CALIFORNIA INST. OF TECH., PASADENA.
Effect of stress concentrations in composite structures
[NASA-CR-176410] N86-15348
Input current shaped ac-to-dc converters
[NASA-CR-176438] N86-15544
Application of electron-transfer theory to several systems of biological interest
[DE85-015835] N86-15860
CALIFORNIA STATE DEPT. OF WATER RESOURCES, SACRAMENTO.
Water resources data for California, water year 1983. Volume 3: Southern Central Valley Basins and the Great Basin from Walker River to Trucker River
[PB85-232312] N86-15720
CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.
Monitoring of hot water plume movements in an aquifer with borehole/surface resistivity measurements
[DE85-014531] N86-15637
Friction in nuclear dynamics
[DE85-011984] N86-16066
GGLP effect from 1959 to 1984
[DE85-011981] N86-16069
Transportable charge in a periodic alternating gradient system
[DE85-015664] N86-16085
Power combiners/dividers for loop pickup and kicker arrays FNAL stochastic cooling rings
[DE85-016562] N86-16121
CALIFORNIA UNIV., DAVIS.
Airborne Doppler measurements of the central California extended sea breeze N86-15791
Experimental studies of L shell X-ray emission from high density plasmas N86-16095
CALIFORNIA UNIV., LOS ANGELES.
Influence of various unsteady aerodynamic models on the aeromechanical stability of a helicopter in ground resonance N86-15294
Beta alumina: A solid-electrolyte as a solid-state laser host
[AD-A159409] N86-15664
Preparation and properties of transition metal beta aluminas
[AD-A159408] N86-16130
CALIFORNIA UNIV., SAN DIEGO.
Seismic moment tensor recovery at low frequencies
N86-15750
CALIFORNIA UNIV., SANTA BARBARA.
Angular-gain spectrum of free electron lasers
[AD-A159412] N86-15665
Paleomagnetism and tectonics of the central and eastern Transverse Ranges, Southern California
N86-15747
Algorithms and software for pole assignment and observers, revision 1
[DE85-016068] N86-15970
CAMBRIDGE UNIV. (ENGLAND).
Novel transport and recombination processes in semiconductors
[AD-A158321] N86-15549
CARNEGIE-MELLON UNIV., PITTSBURGH, PA.
The role of microstructure in hydrogen-assisted crack initiation in high strength steels N86-15375
Representing time and space in an object oriented hardware description language
[AD-A158226] N86-15952
A perturbation approach to robot calibration
[AD-A159166] N86-16004
Search for the XI(2220) at Lear
[DE85-014329] N86-16070
CASE WESTERN RESERVE UNIV., CLEVELAND, OHIO.
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[DE85-016062] N86-15861
CENTER FOR NAVAL ANALYSES, ALEXANDRIA, VA.
The relationship between material failures and flight hours: Statistical considerations
[AD-A159571] N86-15311
CHICAGO UNIV., ILL.
Analysis of satellite data for sensor improvement (detection of severe storms from space) N86-15796
Topics in theoretical physics
[DE85-016734] N86-16074
CHINA SCIENTIFIC AND TECHNICAL UNIV., HOFEI.
Non-uniform bounds of normal approximation for finite-population U-statistics
[AD-A159163] N86-16003
CHRONOS RESEARCH LABS., INC., OLIVEHAIN, CALIF.
Demonstration of a pyroelectric conversion power cycle with a polymer
[AD-A158964] N86-15398
CIAD, ZOETERMEER (NETHERLANDS).
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[ISBN-90-6818-018-5] N86-15977
CINCINNATI UNIV., OHIO.
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[DE85-017155] N86-16035
Self-consistent electronic structure of alpha-phase Hume-Rothery electron compound
[DE85-017560] N86-16080
COASTAL ENGINEERING RESEARCH CENTER, VICKSBURG, MISS.
The TMA shallow-water spectrum description and applications
[AD-A157975] N86-15844
COLORADO SCHOOL OF MINES, GOLDEN.
A preliminary report on some recent results in born inversion
[AD-A158926] N86-15958
COLORADO STATE UNIV., FORT COLLINS.
Investigations of severe/tornadic thunderstorm development and evolution based on satellite and AVE/SESAME/VAS data N86-15809
COLORADO UNIV., BOULDER.
Theoretical and experimental studies in support of the Geophysical Fluid Flow Experiment N86-15772
COLUMBIA UNIV., NEW YORK.
Large aspect ratio, high-beta tokamak fusion reactor
[DE85-016654] N86-16122
COMBUSTION ENGINEERING, INC., CHATTANOOGA, TENN.
Microstructural control to improve the properties of chromium-molybdenum weld metal
[DE85-016179] N86-15390
COMISION NACIONAL DE INVESTIGACION DEL ESPACIO, MADRID.
Measurements of statospheric ozone by indigo decoloration N86-15763

COMMISSARIAT A L'ENERGIE ATOMIQUE, GIF-SUR-YVETTE (FRANCE).
Search for the XI(2220) at Lear
[DE85-014329] N86-16070

COMMISSION OF THE EUROPEAN COMMUNITIES, KARLSRUHE (WEST GERMANY).
Radiation effects in actinide host phases
[DE85-016273] N86-16075

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National Aeronautics and Space Administration authorization for fiscal year 1986
[S-HRG-99-102] N86-16163

COMMITTEE ON SCIENCE AND TECHNOLOGY (U. S. HOUSE).
Space activities of the United States, Soviet Union and other launching countries/organizations, 1957-1984
[GPO-46-504] N86-15330
Congressional Workshop on Advanced Materials Research and Development
[GPO-47-717] N86-15340
Biotechnology and agriculture
[GPO-48-672] N86-15712
Computer security policies
[GPO-52-154] N86-15919
The role of technical information in US competitiveness with Japan
[GPO-51-564] N86-16152
National Science Foundation authorization, 1986
[GPO-46-945] N86-16162

CONNECTICUT UNIV., STORRS.
Crystallographic fatigue crack propagation in single crystal nickel-base superalloy N86-15377

CONSIGLIO NAZIONALE DELLE RICERCHE, FRASCATI (ITALY).
Correlations between signals from gravitational wave antennas in Rome and in Geneva
[PREPRINT-462] N86-15533

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Correlations between signals from gravitational wave antennas in Rome and in Geneva
[PREPRINT-462] N86-15533

CORNELL UNIV., ITHACA, N.Y.
Cryogenic sample stage for the CAMECA IMS-3F ion microscope
[AD-A158071] N86-15362
The ISIS project: R and D status and technical report
[AD-A158930] N86-15959

CRANFIELD INST. OF TECH., BEDFORD (ENGLAND).
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[CAR-8509] N86-15242

D

DALHOUSIE UNIV., HALIFAX (NOVA SCOTIA).
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[AD-A158962] N86-15907

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Electrochemical gas sensors and gas analysis equipment
[DRIC-T-7521] N86-15354

DEFENSE NUCLEAR AGENCY, WASHINGTON, D.C.
Significance of single particle effects in neutral beam weapon lethality
[DE85-012031] N86-16068

DELAWARE UNIV., NEWARK.
Evaluation of spatial, radiometric and spectral Thematic Mapper performance for coastal studies
[E86-10016] N86-15706
A comparison of LANDSAT TM to MSS imagery for detecting submerged aquatic vegetation in lower Chesapeake Bay N86-15707
Remote reconnaissance of submerged aquatic vegetation: A radiative transfer approach N86-15708
Remote sensing of coastal wetlands biomass using Thematic Mapper wavebands N86-15709
Development of slope spectra of the wind-disturbed water surface N86-15842

DEPARTMENT OF ENERGY, NEW YORK.
Worldwide deposition of (90)Sr through 1983
[DE85-017599] N86-15741

DEPARTMENT OF ENERGY, WASHINGTON, D. C.
Optical emission line monitor with background observation and cancellation
[DE85-017745] N86-15370
Low activation ferritic alloys
[DE85-017795] N86-15384
Production of glass or glass-ceramic to metal seals with the application of pressure
[DE85-017746] N86-15403
Extrusion cast explosive
[DE85-017785] N86-15417
Miniature plasma accelerating detonator and method of detonating insensitive materials
[DE85-017747] N86-15418
Workshop on Radiobiological Effectiveness of Neutrons
[DE85-017577] N86-16084
EPIC/JANUS user's guide
[DE85-017027] N86-16158

DEPARTMENT OF THE AIR FORCE, WASHINGTON, D.C.
Resonant cavities for stall recovery in gas turbine engines
[AD-D011891] N86-15317
Solar rocket absorber
[AD-D011897] N86-15336
Simultaneous incremental strain/incremental temperature analog device for, and method, of testing for stress response
[AD-D011912] N86-15411
Wavelength selective demultiplexer tuner
[AD-D011890] N86-15532
Self-guarding Schottky barrier infrared detector array
[AD-D011894] N86-15541
Bipolar digitizer having compression capability
[AD-D011895] N86-15542
A buffer diverter system
[AD-D011902] N86-15559
Ferromagnetic resonance probe liftoff suppression apparatus
[AD-D011913] N86-15647
Machine with an intermittently rotating table for the performance of work operations
[AD-D011911] N86-15669
Adapter pallet system
[AD-D011858] N86-15671
Variable radix processor
[AD-D011893] N86-15918
Interface alignment system
[AD-D011896] N86-16087
Multi-color X-ray line source
[AD-D011910] N86-16088
Selective anodic oxidation of semiconductors for pattern generation
[AD-D011889] N86-16133

DEPARTMENT OF THE ARMY, WASHINGTON, D. C.
Metallographic preparation of particulate filled aluminum metal matrix composite material
[AD-D011862] N86-15352
Anti-trypanosomal activity of platinum coordination compounds
[AD-D011860] N86-15897
Large memory acousto-optically addressed pattern recognition
[AD-D011861] N86-16092

DEPARTMENT OF THE NAVY, WASHINGTON, D. C.
Moldable electrically conductive polymer compositions
[AD-D011887] N86-15402

DESMATICS, INC., STATE COLLEGE, PA.
Statistical research on problems of biodynamics
[AD-A157993] N86-15899

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, COLOGNE (WEST GERMANY).
Results of wind tunnel tests on external combustion
[DFVLR-FB-85-35] N86-15643
Investigations of the effects of gravity on Paramecium caudatum structure and behavior
[DFVLR-FB-85-40] N86-15863
On the effects of X irradiation on the Bacillus subtilis spores in a day and wet system
[DFVLR-FB-85-44] N86-15864

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, GOETTINGEN (WEST GERMANY).
Transonic drag rise and drag reduction by active/passive boundary layer control N86-15275
Numerical study of the laminar shock boundary layer interaction
[DFVLR-FB-85-34] N86-15642
Investigation of large scale structures in a subsonic free jet
[DFVLR-FB-85-38] N86-15644
On second propagation in radial fan casings
[DFVLR-FB-85-32] N86-16053

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, HAMBURG (WEST GERMANY).
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[DFVLR-FB-85-43] N86-15915

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, OBERPFAFFENHOFEN (WEST GERMANY).
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[DFVLR-FB-85-37] N86-15329
Investigations of the interference scattering and methods for its suppression in near-ground radar backscattering measurements
[DFVLR-FB-85-42] N86-15539
Balancing of a rod using a digitally controlled robot
[DFVLR-FB-85-41] N86-15677
Results of icing flights in winter 1983/84: Ice accretion thickness in correlation with cloud physical parameters, object and cloud parameters
[DFVLR-FB-85-39] N86-15838

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, STUTTGART (WEST GERMANY).
Measurement of radiation intensity on the IEA SSPS/CRS solar tower plant in Spain
[DFVLR-FB-85-36] N86-15739

DEUTSCHES ELEKTRONEN-SYNCHROTRON, HAMBURG (WEST GERMANY).
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[DE85-016988] N86-16077

DREXEL UNIV., PHILADELPHIA, PA.
Melting and consolidation of nickel alloy powders with a plasma jet operating in a low pressure inert environment N86-15374
LAMPS software and mesoscale prediction studies N86-15801

DUGWAY PROVING GROUND, UTAH.
Migration of hazardous substances through soil. Part 2: Determination of the leachability of metals from five industrial wastes and their movement within soil
[AD-A158990] N86-15740

DUKE UNIV., DURHAM, N. C.
Nonlinear dynamics of a helicopter model in ground resonance N86-15284

E

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[AD-A159158] N86-16002

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[ENST-85E005] N86-15667

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A multiple pendulum for the demonstration of nonlinear coupling N86-16034

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Development of radiative cooling materials, phase 3
[DE85-014666] N86-15404

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[AD-A159440] N86-15530

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[DE85-014329] N86-16070

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Search for the XI(2220) at Lear
[DE85-014329] N86-16070

F

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Techniques for fatigue life predictions from measured strains
[NASA-CR-178574] N86-15688
Techniques for fatigue life predictions from measured strains. Appendix E: HPOTP bearing cartridge and MCC coolant inlet duct power spectral densities
[NASA-CR-178515] N86-15689

FEDERAL AVIATION ADMINISTRATION, WASHINGTON, D.C.
Some effects of alcohol and simulated altitude on complex performance scores and breathanalyzer readings
[AD-A158925] N86-15905
FERMI NATIONAL ACCELERATOR LAB., BATAVIA, ILL.
TOM: A program for interactive lattice design
[DE85-016988] N86-16077
Pulsed septum magnet for the Fermilab antiproton source
[DE85-016993] N86-16078
Measuring the orbit length of the Tevatron
[DE85-017443] N86-16079
Isolated data acquisition system for high voltage applications
[DE85-016984] N86-16116
Dependence of charge collection distributions and dose on the gas type filling the ionization chamber for a p(66)Be(49) clinical neutron beam
[DE85-017366] N86-16117
Black holes, pregalactic stars and the dark matter problem
[DE85-015385] N86-16168
FLORIDA STATE UNIV., TALLAHASSEE.
Mean residual life: Theory and applications
[AD-A158589] N86-16013
FLORIDA UNIV., GAINESVILLE.
Design of foundations in permafrost
[AD-A158063] N86-15433
DLTS (Deep-Level Transient Spectroscopy) analysis of germanium and Al sub x Ga sub 1-x As solar cells
[AD-A159114] N86-15732
The effect of the Benthic Boundary Layer on the physics of intense mesoscale eddies N86-15751
Use and application of computers in construction estimating
[AD-A158055] N86-15921
Research in applied mathematics related to nonlinear system theory
[AD-A158330] N86-16027
FLOW RESEARCH, INC., KENT, WASH.
Arctic Ocean background noise caused by ridging of sea ice
[AD-A159587] N86-16050
FOREST PRODUCTS LAB., MADISON, WIS.
Condensation potential in high thermal performance walls. Hot, humid summer climate
[AD-A158002] N86-15431
FORSCHUNGSINSTITUT FUER HOCHFREQUENZPHYSIK, WERTHHOVEN (WEST GERMANY).
Underwater sound communication
[REPT-5-85] N86-16038
Estimation of the trajectory parameters of an accelerationless target from angle measurements of a single, stationary, acoustic sensor. Error sources and their influence
[REPT-12-84] N86-16039
FREIBURG UNIV. (WEST GERMANY).
Search for the XI(2220) at Lear
[DE85-014329] N86-16070

G

GENERAL ELECTRIC CO., PHILADELPHIA, PA.
Mod-5A wind turbine generator program design report. Volume 2: Conceptual and preliminary design, book 1
[NASA-CR-174735-VOL-2-BK-1] N86-15722
Mod-5A wind turbine generator program design report. Volume 2: Conceptual and preliminary design, book 2
[NASA-CR-174735-VOL-2-BK-2] N86-15723
Mod-5A wind turbine generator program design report. Volume 3: Final design and system description, book 1
[NASA-CR-174735-VOL-3-BK-1] N86-15724
Mod-5A wind turbine generator program design report. Volume 3: Final design and system description, book 2
[NASA-CR-174735-VOL-3-BK-2] N86-15725
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 1
[NASA-CR-174735-VOL-4-BK-1] N86-15726
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 2
[NASA-CR-174735-VOL-4-BK-2] N86-15727
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 3
[NASA-CR-174735-VOL-4-BK-3] N86-15728
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 4
[NASA-CR-174735-VOL-4-BK-4] N86-15729
Mod-5A wind turbine generator program design report. Volume 4: Drawings and specifications, book 5
[NASA-CR-174735-VOL-4-BK-5] N86-15730
Ceramic automotive Stirling engine study
[NASA-CR-174907] N86-16165
GENERAL ELECTRIC CO., SCHENECTADY, N. Y.
Electrical characteristics of Si devices fabricated with completely consumed carbide (C3) dielectric isolation process
[AD-A158296] N86-15547
GEO-CENTERS, INC., NEWTON, MASS.
Electrolysis of CO(2) by novel metallopolymeric cathodes
[AD-A158228] N86-15364
GEOLOGICAL SURVEY, COLUMBUS, OHIO.
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[PB85-230233] N86-15719
GEOLOGICAL SURVEY, SACRAMENTO, CALIF.
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[PB85-232312] N86-15720
GEOLOGICAL SURVEY, TACOMA, WASH.
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[PB85-236834] N86-15721
GEORGIA INST. OF TECH., ATLANTA.
On looking into the black box: Prospects and limits in the search for mental models
[AD-A159080] N86-15913
GEORGIA TECH RESEARCH INST., ATLANTA.
Integrated optoelectronic circuits utilizing InGaAsP grown by molecular beam epitaxy
[AD-A159403] N86-16129
GRAZ UNIV. (AUSTRIA).
Submicron phonics 1
[AD-A159421] N86-16131

H

HAYDEN (CHRISTOPHER), MADISON, WIS.
Time composite sounding N86-15808
HELSINKI UNIV. (FINLAND).
Activities report of the Radio Laboratory
[REPT-S-160] N86-15534
Exact image method for impedance computation of antennas above the ground
[REPT-S-161] N86-15535
Formulas concerning nonelectrical properties of snow: The electrical engineer's point of view
[REPT-S-156] N86-15715
Microwave radiometers for remote sensing applications
[REPT-S-157] N86-15716
Mixing formulas and experimental results of the dielectric constant of snow
[REPT-S-158] N86-15717
HERNDON SCIENCE AND SOFTWARE, INC., SAN DIEGO, CALIF.
Technological applications of Earth core research
[AD-A158991] N86-15759
HOKKAIDO UNIV., SAPPORO (JAPAN).
Bulletin of the Faculty of Engineering, Hokkaido University, no. 128
[ISSN-0385-602X] N86-15420
Deformation behavior of anisotropic sand during principal stress axes rotation N86-15421
A study of reactive sputter etching for carbon steel by Freon gas: On the effect of oxygen gas mixture N86-15422
Athermal conditions of optical elements and properties of optical materials N86-15423
The catalytic activity and selectivity of chemical treated clinoptilolite in the conversion of methanol N86-15424
Crystal analyser mirror type down-scattering spectrometer using spallation neutron source N86-15425
On the assignment algorithm by means of multi-linked data structure N86-15426
Accuracy of polynomial approximation of quasi-minimax methods N86-15427
Analysis of drops in accuracy of least-squares approximation N86-15428
Geophysical Bulletin of Hokkaido University, no. 46
[ISSN-0439-3503] N86-15695
The reduction of nocturnal cooling value by smudging N86-15696
Observations on the atmospheric electrical environment of sea fog in the Pacific Coast of Eastern Hokkaido, Japan N86-15697
A numerical study on the response of the tropical Pacific sea surface temperature to a sudden change of wind stress N86-15698
A numerical modelling of the seasonal variation of the tropical Pacific sea surface temperature N86-15699
A numerical simulation of coastal mixed layer by a modified 1-D DKT model N86-15700
A study of the strong ground motion of the western Hidaka, Hokkaido earthquake N86-15701
Seismic intensity survey and hypocenter recalculation on the 1985 Sapporo earthquake (M 3.5) N86-15702
HONEYWELL SYSTEMS AND RESEARCH CENTER, MINNEAPOLIS, MINN.
Superlattice optical bistability research
[AD-A158876] N86-16128
HOUSTON UNIV., TEX.
Nondestructive ultrasonic characterization of engineering materials
[NASA-CR-176349] N86-15680
HOWARD UNIV., WASHINGTON, D. C.
Dynamic response characteristics of a circulation control rotor model pneumatic system N86-15298
HUGHES HELICOPTERS, CULVER CITY, CALIF.
Development of an unsteady aerodynamics model to improve correlation of computed blade stresses with test data N86-15288

I

IBM WATSON RESEARCH CENTER, YORKTOWN HEIGHTS, N.Y.
Investigation of quantum effects in heterostructures
[AD-A158327] N86-15550
IIT RESEARCH INST., ARLINGTON, VA.
Ada (trade name) compiler validation summary report: Rational environment, version A.2.0.5 for rational R1000
[AD-A157830] N86-15949
ILLINOIS INST. OF TECH., CHICAGO.
Mechanical properties and deformation behavior of martensite-ferrite dual-phase steels N86-15373
ILLINOIS STATE WATER SURVEY, CHAMPAIGN.
Variation objective analyses for cyclone studies N86-15777
ILLINOIS UNIV., CHAMPAIGN.
Search for the XI(2220) at Lear
[DE85-014329] N86-16070
ILLINOIS UNIV., URBANA.
Chemiluminescence from organic reactions. Formation of diphenoyl peroxide as an intermediate
[AD-A159144] N86-15341
Reactions of singlet oxygen with enol esters
[AD-A159160] N86-15342
INDIAN INST. OF SCIENCE, BANGALORE.
A review of dynamic inflow and its effect on experimental correlations N86-15293
INFORMATION AND CONTROL SYSTEMS, INC., HAMPTON, VA.
PIFCGT: A PIF autopilot design program for general aviation aircraft
[NASA-CR-166123] N86-15320
INFORMATION SCIENCE INST., MARINA DEL REY, CALIF.
A research program in computer technology
[AD-A157991] N86-15920
INSTITUT D'AERONOMIE SPATIALE DE BELGIQUE, BRUSSELS.
The CO2 and CO abundances below 130 km altitude from infrared spectra
[AERONOMICA-ACTA-A-296-1985] N86-15753
INSTITUT FRANCO-ALLEMAND DE RECHERCHES, ST. LOUIS (FRANCE).
Vortices and pressure waves at trailing edges
[ISL-CO-224/84] N86-15252
Damping of the rolling motion of full caliber fin-stabilized projectiles in supersonic flight
[ISL-CO-233/84] N86-15253
Quasi nonstretching hypervelocity jets
[ISL-CO-236/84] N86-15254
Particle sizing with whisker collectors
[ISL-CO-230/84] N86-15639
New experimental techniques for probing gun barrel boundary layers
[ISL-CO-234/84] N86-15640
Spectroscopic temperature measurements in interior ballistic environments
[ISL-CO-235/84] N86-15641
Use of optical fibers in pulsed holography
[ISL-CO-231/84] N86-15657
Study of high speed combustion flows by laser velocimetry
[NASA-CR-176439] N86-15668
INSTITUTE FOR DEFENSE ANALYSES, ALEXANDRIA, VA.
Small turbine technology review
[AD-A158514] N86-15316
INSTITUTE FOR SCIENTIFIC RESEARCH, STONEHAM, MASS.
Molecular processes in a high temperature shock layer
[NASA-CR-176357] N86-16054

INSTITUTE OF OCEANOGRAPHIC SCIENCES, BIRKENHEAD (ENGLAND).
Automatic calibration of the temperature channel on Banderaa recording current meters
[IOS-206] N86-15856
INSTITUTE OF OCEANOGRAPHIC SCIENCES, TAUNTON (ENGLAND).
A numerical model of the turbulent boundary layer beneath surface waves and tides
[IOS-196] N86-15854
INSTITUTE OF OCEANOGRAPHIC SCIENCES, WORMLEY (ENGLAND).
A review of biological processes within oceanic water columns relevant to the assessment of the safety of disposal of waste, notably radioactive isotopes, on or within the seabed
[IOS-198] N86-15745
The CTD data from the Northeast Atlantic 22 N-33 N, 19 W-24 W, July 1983. Discovery cruises 138, 139.
[IOS-188] N86-15850
CTD data from the Northeast Atlantic Ocean 40-48 N, 12-21 W collected on RRS DISCOVERY cruise 132 in February 1983
[IOS-192] N86-15851
The IOS geophysical data held on magnetic tape - summary. Bathymetric, magnetic and gravity data collected during marine geology and geophysics cruises 1973 - 1984
[IOS-194] N86-15852
A re-analysis of SWOP data
[IOS-195] N86-15853
The permeability and consolidation of deep sea sediments
[IOS-201] N86-15855
INSTITUTO DE PESQUISAS ESPACIAIS, SAO JOSE DOS CAMPOS (BRAZIL).
The twilight sodium layer
[INPE-3568-PRE/773] N86-15754
Large-scale circulation anomalies and the predictability of northeast Brazil droughts
[INPE-3656-PRE/819] N86-15768
A new enumeration scheme for the knapsack problem
[INPE-3563-PRE/769] N86-15983
An exact algorithm for the knapsack problem
[INPE-3645-PRE/815] N86-15984
LaPlace transformation with REDUCE 2
[INPE-3649-PRE/816] N86-15985
Nonlinear control of distributed parameter systems
[INPE-3623-PRE/807] N86-15986
Control of nonlinear distributed parameter systems
[INPE-3624-PRE/808] N86-15987
Merits and demerits of the Maximum Entropy Spectral Analysis (MESA) method
[INPE-3590-PRE/787] N86-16012
Short-lived solar burst spectral component at approximately 100 GHz
[INPE-3550-PRE/762] N86-16176
INSTITUUT TNO VOOR WERKTUIGKUNDIGE CONSTRUCTIES, DELFT (NETHERLANDS).
Static and dynamic material model for elastohydrodynamic bearing calculations
[IWECO-5076503] N86-15676
INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA (AUSTRIA).
Demonstration of the in-field use of calorimetric assay for IAEA inspection purposes
[DE85-016448] N86-16083
INTERNATIONAL CENTRE FOR DIFFRACTION DATA, SWARTHMORE, PA.
Standard X-ray diffraction powder patterns
[NBS/MN-25-SEC-21] N86-15357
INTERNATIONAL METEOROLOGICAL INST., STOCKHOLM (SWEDEN).
Activities report in meteorology
[AR-83/84] N86-15836
INTERSOL POWER CORP., LAKEWOOD, COLO.
Development and fabrication of photovoltaic concentrator modules for a point-focus Fresnel lens array
[DE85-017322] N86-15734
IOWA UNIV., IOWA CITY.
Effects of waves on the boundary layer of a surface-piercing body
[AD-A158053] N86-15633
Residues of integrals with three-dimensional multipole singularities, with application to the Lagally theorem
[AD-A158771] N86-15995

J

JET PROPULSION LAB., CALIFORNIA INST. OF TECH., PASADENA.
Fundamental study of flow field generated by rotorcraft blades using wide-field shadowgraph
[NASA-CR-176443] N86-15249
A proposed technique for the Venus balloon telemetry and Doppler frequency recovery
[NASA-CR-176448] N86-15333
Novel sorbents for high temperature regenerative H2S removal
[NASA-CR-176449] N86-15360
Antimisting kerosene: Development of a continuous 10 GPM in-line blender
[NASA-CR-176432] N86-15412
JOINT PUBLICATIONS RESEARCH SERVICE, ARLINGTON, VA.
USSR report: Chemistry
[JPRS-UCH-85-013] N86-15344
Evaluating structural changes in jet fuels by electrical conductivity and viscosity N86-15345
Effects of vibration-induced cavitation of physicochemical characteristics of aircraft fuel N86-15346
Energy function and conductivity of metal-polymer composites N86-15347
East Europe report: Science and technology
[JPRS-ESA-85-037] N86-15408
Thermally, chemically resistant enamels N86-15409
Use of new polyurethane in leather substitute N86-15410
West Europe report: Science and technology
[JPRS-WST-85-028] N86-15435
FRG turns efforts to laser development N86-15436
Fuji, Thomson to develop, produce high-powered transistors N86-15437
China report: Science and technology
[JPRS-CST-85-038] N86-15438
Hydrogen diffusion, positron annihilation in 40CrNiMo steel N86-15439
China reaches new level in minicomputer development N86-15440
Micro-power dissipation device described N86-15441
Self-quenching streamer discharge characteristics at extreme gas compositions N86-15442
West Europe report: Science and technology
[JPRS-WST-85-015] N86-15443
CNES of France researches remote control system for space N86-15444
Speed of Hermes to give Europeans space access, Ducrocq says N86-15445
DFVLR develops new kind of walls or wind tunnel N86-15446
West Europe report: Science and technology
[JPRS-WST-85-024] N86-15447
Launchers, satellites, multinational plans in 1985 CHES budget N86-15448
MBB studies variable-camber wing for Airbus N86-15449
French program CHARME develops propfan aircraft N86-15450
FRG uses laser for non-destructive testing in wind canal N86-15451
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-009] N86-15452
Millimetric-wave antennas and devices: Review N86-15453
Synthesis of log-periodic antennas with prescribed geometry N86-15454
Boundary waves in finite antenna arrays N86-15455
Scattering by cylinder with anisotropic impedance N86-15456
Matrix analysis of periodic interleaved multifrequency antenna arrays N86-15457
Analysis of multimode waveguide-type power distributor N86-15458
Excitation of array of plane-parallel waveguides covered with dielectric layer of finite length N86-15459
Use of active quenching for reduction of power dissipation in dipole antenna array N86-15460
Signal and interference levels in antenna array with optimum radiation pattern N86-15461
Effect of corner reflector on field of linear radiator N86-15462
Longitudinally slotted cylindrical shield with finite thickness and electrical conductance N86-15463
Radiation pattern and reduced gain of linear antenna in turbulent anisotropic atmosphere N86-15464
Multilayer volume microwave filters N86-15465
Plasma parameters at low level of intrinsic microwave radiation N86-15466
Active microwave filters N86-15467
Analysis of transients in direct current cable insulation N86-15468
Laser technology in manufacture of printed-circuit boards N86-15469
Procedure for calculating attenuation in and reliability of atmospheric optical data transmission systems N86-15470
Selection of signals for digital optical channel N86-15471
Efficiency of coherent reception of optical signal propagating through turbulent atmosphere N86-15472
East Europe report: Science and technology
[JPRS-ESA-85-033] N86-15473
Robotron hardware compatible programming languages surveyed N86-15474
Call to expand information network for basic research N86-15475
GDR scientists develop electroluminescence display N86-15476
Scientists cite uses of cryogenics, low temperature measurement N86-15477
China report: Science and technology
[JPRS-CST-85-040] N86-15478
MC68000 monitor program disassembled N86-15479
Microprocessor application in error code correction N86-15480
Novel control circuit for proximity focused microchannel plate image intensifiers N86-15481
Delay effect in pulsed avalanche discharge of an XeCl laser at high gas pressure N86-15482
Pseudoinverse restoration of blurred image in uniform motion N86-15483
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-011] N86-15484
Surface passivation of semiconductor circuit elements with layer of wideband semiconductor N86-15485
Characteristics of electrophysical and photoelectric properties of MOS-structures on indium arsenide N86-15486
Predicting and diagnosing performance of transistors, integrated circuits and large-scale-integration systems by multilevel simulation methods and programs N86-15487
Nonsinusoidal modes of oscillator with multifrequency surface-acoustic-wave resonator N86-15488
Noise characteristics of stroboscopic transducers built with GaAs microcircuit integration N86-15489
Structural transformations in semiconductors during optical pumping N86-15490
Methodology for determining dynamic characteristics of tristable-logic integrated circuits N86-15491
Reducing dynamic errors of integrated-circuit CMOS switches N86-15492
Optimum frequency of communication channel for indoor radio telemetry N86-15493
Main trends in satellite communication and broadcasting research N86-15494
Transmission of television signals over optical communication channel by means of frequency modulation N86-15495
Apparatus for experimental study of high-resolution radiometers and their characteristics N86-15496
Frequency characteristics of differential optron N86-15497
High-power sources with smoothly adjustable pulse duration for powering gas-discharge tubes of laser pumping systems N86-15498
High-power pulse generator with pulseform control for powering gas-discharge tubes of laser pumping systems N86-15499
Experimental study of unidirectional ferrite microstrip lines N86-15500
Self-modulation instability of gyrotron emission N86-15501
Active magnetic suspension in main magnetic field of electric motor N86-15502
Mathematical modeling of main lightning stage N86-15503
Determination of electromagnetic forces in magnetic field calculations N86-15504
Pulse-type voltage stabilizer with integral pulse-width modulation N86-15505
Properties of optical filters on CdSe-HgSe base N86-15506
Investigation of hologram analyzer with single-component optical hologram matching system N86-15507
Influence of roughness of ends of fiber optic plates on modulation transfer coefficient N86-15508
Generation of electromagnetic radiation in radio-frequency band in solids exposed to laser radiation N86-15509
Venus-15, Venus-16 synthetic aperture radar on Venus satellite orbit N86-15510
Absolute measurements of antenna parameters by illumination method N86-15511
Time characteristics of scattering by radar targets N86-15512
Effectiveness of phase-conjugation systems in turbulent atmosphere N86-15513
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-006] N86-15561
Solution to reverse refraction problem N86-15562
Maximum antenna power reception in lossy medium N86-15563

Determination of point source image field structure by real radiooptical antenna N86-15564
Experimental study of magnetostatic wave propagation through film waveguides N86-15565
Statistical characteristics of ultrashort-wave signal fast phase fluctuations based on amplitude measurements on sea lanes N86-15566
Estimating number and parameters of signal components in presence of noise N86-15567
Modular floating decimal point operations for antenna array adaptation N86-15568
Local ionospheric irregularity effect on ELF radiowave propagation N86-15569
Ionosphere influence on MHD wave bundle propagation N86-15570
Contribution to multilayer spherical screen theory N86-15571
Adiabatic invariant value variation under shortwave band subcritical conditions N86-15572
Degradation of surface-acoustic-wave resonators N86-15573
Effect of cylindrical reradiator on parameters of antenna and antenna array N86-15574
Basic characteristics of radar antenna with synthesized aperture tracking arbitrary motion of aircraft N86-15575
Characteristics of radar objects detectable by superwide-band signals N86-15576
Reflection coefficient of harrow grating with conductor strips with respect to electromagnetic waves N86-15577
Modulation instability and solitons of electromagnetic wave envelopes in ferromagnetic semiconductors N86-15578
Digital methods of recording color television images on film tape N86-15579
Color-encoding raster light filters for single-tube color television cameras N86-15580
Improvement of color reproduction by television cameras N86-15581
Luminescence photography N86-15582
Design of differential circuit for LSI N-threshold comparator N86-15583
Efficiency of storing pulse products in coherent signal packets N86-15584
Efficiency of amplitude suppression on sinusoidal interference N86-15585
Lower limit of error probability in discrete addition of binary signals from parallel channels N86-15586
Methods of equalizing electric fields in high-voltage devices N86-15587
Dependence of electric current through human body on parameters of 3-0 network in range of high insulation admittance N86-15588
Rate of widening of strong-field domain in supercritically doped Gunn-effect devices N86-15589
Intrinsic magnetic field of electron beam N86-15590
Stimulated emission of bounded strong-current electron beam with longitudinal magnetic field magnetostatic pumping N86-15591
Tubular strong-current relativistic electron beam instability N86-15592
Faster-than-light sources in electron beams N86-15593
Analysis and identification of inertial devices N86-15594
New type of impurity defects in semiinsulating gallium aresenide N86-15595
Picosecond photoconductivity of indium aresenide N86-15596
Dynamics of recrystallization and redistribution of impurities in semiconductors exposed to millisecond laser radiation N86-15597
Principles and problems of building dc electric drives with symistor control N86-15598
Modular distributor for controlling group of electric drives N86-15599
Electric drive motors for industrial robots N86-15600
Two-step pulse triggering of dynistor power switches N86-15601
Experimental determination of turn-off time of high-voltage power thyristors N86-15602
Recommendations for developing simulators of solar radiation penetrating to the Earth's surface N86-15603
Measuring radiation electroconductivity of solid dielectrics exposed to pulsed ionizing radiation N86-15604
Analysis of automated light guide pulse dispersion measurement N86-15605
Internal conditions for self excitation of superconductor DC generators N86-15606
Effect of conductor profile on force characteristics due to motion of a magnetic field source N86-15607
Strip and microstrip line periodic heterogeneities N86-15608
Thin-film bolometer power transduce electrodynamic analysis and experimental investigation N86-15609
Power combinations microwave amplifier loading characteristics N86-15610
Influence of higher types of oscillations on piston-tuned waveguide Gunn oscillator frequency N86-15611
Analysis of elliptical waveguides in cylindrical reference basis N86-15612
Photographic recording of trajectories of aerosol particles by method of multiple exposure N86-15613
Investigation of reverse branch of voltage-current curve of GaAs high-voltage p-n structure N86-15614
Influence of embedded electrical fields on temperature stability of parameters of I-Ga-As heterophotoelements N86-15615
High-frequency characteristics of ballistic bipolar heterojunction transistors N86-15616
Sensitivity of squids built with low-capacitance Josephson tunnel junctions N86-15617
External locking of IMPATT-diode power oscillators N86-15618
Maximum attainable sensitivity of dc squids built with Josephson tunnel junctions N86-15619
Standardization of Schwarz-Christoffel transformation for engineering design of semiconductor and hybrid integrated-circuit elements N86-15620
Experimental investigation of acoustic wave electrical excitation in electrolyte solution N86-15621
Acoustooptic demodulator of phase-keyed signals N86-15622
West Europe report: Science and technology [JPRS-WST-85-027] N86-15678
Fiat to assemble efficient engine in automated plant N86-15679
USSR report: Space Biology and Aerospace Medicine, volume 19, no. 4, July - August 1985 [JPRS-USB-85-006] N86-15865
Problems of studying flight work in Soviet aviation medicine of the 1920's - 1930's N86-15866
Some aspects of determining human physical work capacity under hyperbaric conditions N86-15867
Investigation of factors determining pilot's geocentric orientation N86-15868
Effect of threat stress on psychomotor stability of pilots differing in anxiety level N86-15869
Use of flight simulators for demonstration of functional capacities of flight personnel N86-15870
Effect of level of physical activity on lipid metabolism of flight personnel N86-15871
Oxygenation and regional circulation in gingival mucosal tissues under effect of head-to-pelvis (+Gz) accelerations N86-15872
Investigation of some aspects of human amino acid metabolism during 120-day antiorthostatic hypokinesia N86-15873
Effect of 7-day immersion hypokinesia on characteristics of precision movements N86-15874
Effect of dry immersion model on parameters of fluid-electrolyte metabolism, blood plasma aldosterone and cortisol levels in individuals differing in body fluid content N86-15875
Intensity of lipid peroxidation in hypokinetic rat tissues N86-15876
Effect of 24,25-dihydroxyvitamin D3 on osteogenetic precursor cells in immobilized rats N86-15877
Basic results of experiments with long-term rotation of rats as applied to the problem of artificial gravity N86-15878
Man's tolerance to fulminant form of hypoxic hypoxia N86-15879
Investigation of catecholamine metabolism at high altitudes N86-15880
Determination of increment of Bacillus subtilis biomass in weightlessness N86-15881
investigation of microflora of chufa, a potential higher plant component of biological life-support systems for man N86-15882
Investigation of distinctions referable to growth, development and metabolism of Closteriopsis acicularis algae when cells are limited in nitrogen as related to biological life-support systems for man N86-15883
Formation of volatile substances during polymer destruction by Pseudomonas aeruginosa N86-15884
One aspect of crew training N86-15885
Method of calculating angular dimensions of flight vehicle cockpit canopy casings N86-15886
Informativeness of echo signal in pulsed ultrasonography of the brain (with use of model) N86-15887
Investigation of possibility of using two-frequency impedometry for estimation of proportion of total and extracellular body fluids N86-15888
Automatic determination of cardiac output from rheogram of the trunk N86-15889
Functional state of the olfactory analyzer in a pressurized environment N86-15890
Gas chromatographic analysis of free fatty acids of skin surface lipids N86-15891
Investigation of mineral nutrition of a new form of microalgae to be used in biological life-support systems N86-15892
East Europe report: Science and technology [JPRS-ESA-85-031] N86-15893
Advances in radiobiological research: Hypoxic irradiation effects N86-15894
Tritium ingestion in rats N86-15895
Advances in optoelectronic, nuclear reactor, radiobiological research: High voltage optocoupler N86-15896
USSR report: Cybernetics, computers and automation technology [JPRS-UCC-85-004] N86-15927
Raising the reliability of a remote processing system N86-15928
Procedures and general method for checking microprocessor malfunctions on the basis of pseudorandom testing sequences N86-15929
Microelectronics technology N86-15930
Organization of processor oriented to multiprocessing N86-15931
Modeling problem-oriented multiprocessor systems N86-15932
Multiprocessor systems with dynamic redistribution of requests through a common bus N86-15933
Using digital simulation in the design of CAMAC systems N86-15934
Wide-band single-board analog-digital converter N86-15935
Cybernetics Institute develops parallel-processing computer N86-15936
Program base for raster display N86-15937
High-speed receivers of microprocessor signal conversion devices N86-15938
Problems of devloping algorithmic design system N86-15939
Functional-logical system for automated planning of robot production line control systems N86-15940
Automated flaw detection information-measuring system N86-15941
Red-graphic editor in printed circuit board design system N86-15942
USSR report: Cybernetics, computers and automation technology [JPRS-UCC-85-009] N86-15943
Possibility of artificial intelligence in computers N86-15944
Belorussian computer speaks, reads graphics, X-rays N86-15945
Mathematical theory of holographic memory N86-15946
Work on putting computer and CRTs in airliner control panels N86-15947

K

KAMAN AEROSPACE CORP., BLOOMFIELD, CONN.
Ground resonance analysis using a substructure modeling approach N86-15282
Optimal design application on the advanced aeroelastic rotor blade N86-15290
KANSAS UNIV. CENTER FOR RESEARCH, INC., LAWRENCE.
An analysis of cross-coupling of a multicomponent jet engine test stand using finite element modeling techniques [NASA-CR-176424] N86-15323
KARLSRUHE UNIV. (WEST GERMANY).
Activities and results report for the special domain 210 [KU-SFB-210/A/11] N86-15645
KEIO UNIV., YOKAHAMA (JAPAN).
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KERNFORSCHUNGSZENTRUM, KARLSRUHE (WEST GERMANY).
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KOBE UNIV. OF MERCANTILE MARINE (JAPAN).
Magnetic insulation in an ion diode with toroidal magnetic field N86-16099

L

LA JOLLA INST., CALIF.
Theoretical studies in nondestructive evaluation (NDE) [AD-A159155] N86-15682
LAWRENCE LIVERMORE NATIONAL LAB., CALIF.
Calculating the vulnerability of synthetic polymers to autoignition during nuclear flash [AD-A159420] N86-15399

Analysis of dislocation kinetics across shocks
[DE85-016444] N86-15638
Ultimate limits of FT-IR
[DE85-016442] N86-15652
Application and implementation of transient algorithms in computer programs
[DE85-015396] N86-15968
Data flow graph optimization in IF1
[DE85-007979] N86-15975
Collective accelerator for electron colliders
[DE85-012878] N86-16059
Tables of masses, binding energies, half-lives and natural abundances
[DE85-016344] N86-16061
MBE-4, a heavy ion multiple-beam experiment
[DE85-016626] N86-16064
Radionuclide Migration Project 1984
[DE85-017383] N86-16076
Solution of the field equations for 2-D electromagnetic direct implicit plasma simulation
[DE85-016073] N86-16123
Stellar core collapse and supernova
[DE85-017398] N86-16172
Theoretical models for Type 1 and Type 2 supernova
[DE85-016288] N86-16174
Emission region of gamma ray bursts
[DE85-013198] N86-16183

LEHIGH UNIV., BETHLEHEM, PA.
Application of fracture mechanics principles to fatigue crack growth in a powder metallurgy Ni-base superalloy N86-15372

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[DE85-016288] N86-16174

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Aircraft drag reduction technology: A summary N86-15267
Recent developments in three-dimensional wake analysis N86-15273

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[DE85-015385] N86-16168

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Mach stem characterization in Mbar designs using RSR powder
[DE85-015700] N86-15385
Assessment of dynamic energy conversion systems for radioisotope heat sources
[DE85-016202] N86-15737
CAT: An interactive graphics code
[DE85-016212] N86-15967
Computer simulation of nonequilibrium processes
[DE85-015708] N86-16036
Summary from Working Group on Multiple Beams and Funneling
[DE85-015694] N86-16065
Self-consistent electronic structure of alpha-phase Hume-Rothery electron compound
[DE85-017560] N86-16080
Laser produced plasma affects on welding
[DE85-009636] N86-16118
Plasma heating effects during laser welding
[DE85-010776] N86-16119
Laser intracavity absorption as a plasma diagnostic aid
[DE85-015741] N86-16120
Structural examination of iridium-based single-crystal preparations
[DE85-017550] N86-16136
Overlap of electron core states for very high compressions
[DE85-015745] N86-16138
Logical and physical database design with a full-text environment
[DE85-015683] N86-16159
Code developer's guide to the Styx Liaison Library: A software interface for accessing and manipulating Styx opacity data
[DE85-014253] N86-16160
Cosmogenic neutron-capture-produced nuclides in stony meteorites
[DE85-012689] N86-16170
Possibilities at LAMPF for studying nuclei of astrophysical interest
[DE85-017526] N86-16173
Recurrent population 2 X-ray transients - similarities to SU UMa cataclysmic variables
[DE85-014075] N86-16184

LOS ALAMOS SCIENTIFIC LAB., N. MEX.
Use of chemical explosives for emergency solar flare shelter construction and other excavations on the Martian surface
[DE85-014131] N86-16176

M

MARYLAND UNIV., COLLEGE PARK.
Flap-lag-torsion stability in forward flight N86-15296
Dynamic stability of a bearingless circulation control rotor blade in hover N86-15297
Microstructural origins of hot spots in RDX explosive and several reference inert materials
[AD-A158223] N86-15413
Binocular image flows: Steps toward stereo - motion fusion
[AD-A158089] N86-15901
A graphical similarity measure for time series models
[AD-A158869] N86-15996
A delayed random choice quantum mechanics experiment using light quanta N86-16143
Field test of the methodology for generating efficiency and effectiveness measures
[AD-A158183] N86-16149

MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
Test for a possible melting transition in grain boundaries in aluminum near the melting point
[DE85-013238] N86-15387
A two-terminal microelectrochemical diode with contact spacing of about one micron. A device based on one solution redox couple and one electrode-confined redox couple
[AD-A158774] N86-15553
Limit analysis of transversely loaded grillages
[AD-A158988] N86-15692
User's manual for Massachusetts Institute of Technology Solar Thermal Pond Program (MITSOL)
[DE85-012147] N86-15733
KBEmacs (Knowledge-Based Editor in emacs): A step toward the programmer's apprentice
[AD-A157814] N86-15948
The revised report on Scheme or an uncommon Lisp
[AD-A159423] N86-15963
Ultrasonic measurement of particles in a viscous fluid
[AD-A158989] N86-16046
Queueing network systems with unbalanced flows and their applications to performance evaluation of highly parallel distributed information systems: Revision
[AD-A158052] N86-16154
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[NASA-CR-174971] N86-16164

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[AD-A159402] N86-15529

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[AD-A159405] N86-15683

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[BMFT-FB-W-85-009] N86-15766

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Numerical solutions for three-dimensional cases: Swept wings N86-15263

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Activities report in aerospace research N86-15240
Broadband simulation of multipath propagation in VHF mobile radio
[MBB-UA-905/85] N86-15540

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The optical spectra of aerosols
[AD-A158057] N86-15758

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[MET-O-MEMO-113] N86-15767

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Investigations of laser initiated discharge channels
[AD-A158872] N86-15660
The detection of faint space object with solid state image detectors
[AD-A158594] N86-16166

MIDWEST RESEARCH INST., GOLDEN, COLO.
Integrating sphere spectrometer for high-temperature materials characterization
[DE85-012170] N86-15656
165-kW open-cycle OTEC experiment
[DE85-008818] N86-15735
Analysis of a direct radiation solar dehumidification system
[DE85-008820] N86-15736
System engineering and energy cost analysis of small and medium wind turbines
[DE85-012159] N86-15738
Structural and electrical characterization of polycrystalline semiconductor materials
[DE85-012166] N86-16135

MINNESOTA UNIV., MINNEAPOLIS.
Peat landforms along the Albany River, northern Ontario. An ecological study of peat landforms in Canada and Alaska
[E86-10014] N86-15704

MISSION RESEARCH CORP., SANTA BARBARA, CALIF.
A brief investigation of adaptive decision feedback equalization for digital HF links employing PSK (Phase Shift Keying) modulation
[AD-A157809] N86-15545

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Mobile intercept of storms N86-15771
A theoretical investigation of acoustic cavitation
[AD-A158058] N86-16042

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A new approach to signal registration with the emphasis on variable time delay estimation N86-15514

MITRE CORP., BEDFORD, MASS.
Effect of antenna impedance mismatch on the signal-to-noise ratio of a radio receiving system
[AD-A159070] N86-15525
A design evaluation checklist for user-system interface software
[AD-A158599] N86-15954

MONSANTO CO., DAYTON, OHIO.
Variability of major organic components in aircraft fuels
[AD-A159057] N86-15415

MOUND LAB., MIAMISBURG, OHIO.
Operational methods for data interpolation
[DE85-016050] N86-15969
Demonstration of the in-field use of calorimetric assay for IAEA inspection purposes
[DE85-016448] N86-16083
Precessions of the Earth and the Bohr atom
[DE85-015612] N86-16171

N

NAGAOKA TECHNOLOGICAL UNIV., NIIGATA (JAPAN).
Characteristics of intense pulsed ion beam extracted from dual-current-feed magnetically-insulated diode N86-16103
Time-resolved measurement of energy and species of an intense pulsed ion beam N86-16104

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[IPPJ-742] N86-16096
Pulse power transport to REB diode through slender MITL N86-16100
Geometric compression of hollow cylinder in a coaxial relativistic electron beam diode N86-16101
Magnetohydrodynamic stability of sphereomak plasma in toroidal flux conserver with rectangular cross section. Part 2: Application of Mercier criterion
[IPPJ-743] N86-16114

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Accelerator timing system
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Reference test cases and contributors N86-15261

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[NASA-TM-77942] N86-15314
Fluidized reduction of oxides on fine metal powders without sintering
[NASA-TM-77928] N86-15379
Manufacture of dense sintered bodies containing silicon nitride
[NASA-TM-77929] N86-15396
Hot isostatic pressing of ceramics
[NASA-TM-77931] N86-15397
Monolithic cascade-type solar cells
[NASA-TM-77926] N86-15731

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. AMES RESEARCH CENTER, MOFFETT FIELD, CALIF.
Performance and loads data from a hover test of a full-scale XV-15 rotor
[NASA-TM-86833] N86-15243
Relative advantages of thin-layer Navier-Stokes and interactive boundary-layer procedures
[NASA-TM-86778] N86-15244
A consistent spatial differencing scheme for the transonic full-potential equation in three dimensions
[NASA-TM-86716] N86-15246
Separated transonic airfoil flow calculations with a nonequilibrium turbulence model
[NASA-TM-86830] N86-15247
Rotorcraft Dynamics 1984
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The use of active controls to augment rotor/fuselage stability N86-15281
The influence of dynamic inflow and torsional flexibility on rotor damping in forward flight from symbolically generated equations N86-15295
Evaluation of a load cell model for dynamic calibration of the rotor systems research aircraft N86-15304
Catalytic surface effects on contaminated space shuttle tile in a dissociated nitrogen stream
[NASA-TM-86770] N86-15335
Stress concentration around a small circular hole in the HiMAT composite plate
[NASA-TM-86038] N86-15350
Computational fluid dynamics at NASA Ames and the numerical aerodynamic simulation program
[NASA-TM-86769] N86-15626
Numerical simulation of viscous supersonic flow over a generic fighter configuration
[NASA-TM-86823] N86-15627
Biochemical processes in sagebrush ecosystems: Interactions with terrain
[E86-10015] N86-15705
Searching the horizon: A history of Ames Research Center, 1940-1976
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Hypersonic characteristics of an advanced aerospace plane at Mach 20.3
[NASA-TM-86435] N86-15245
Investigation of a supersonic cruise fighter model flow field
[NASA-TM-86361] N86-15248
Design considerations for application of laminar flow control systems to transport aircraft N86-15270
Turbulent drag reduction for external flows N86-15271
Lifting surface theory for a helicopter rotor in forward flight N86-15287
Aeroelastic considerations for torsionally soft rotors N86-15289
Prediction of wing aeroelastic effects on aircraft lift and pitching moment characteristics
[NASA-TM-87631] N86-15319
Studies of molecular properties of polymeric materials: Aerospace environmental effects on three linear polymers
[NASA-TM-87532] N86-15391
Studies of molecular properties of polymeric materials: Aerospace environmental effects on three linear polymers (polymer durability) N86-15392
Radio-frequency electrical properties of some neat and metal-doped polyimides N86-15393
Taylor-Goertler instabilities of Tollmien-Schlichting waves and other flows governed by the interactive boundary layer equations
[NASA-CR-178010] N86-15628
Instability of time-periodic flows
[NASA-CR-178009] N86-15629
Solar-pumped solid state Nd lasers
[NASA-TM-87615] N86-15658
Analytical study of acoustic response of a semireverberant enclosure with application to active noise control
[NASA-TP-2472] N86-16040
Location of noise sources using a phase-slope method
[NASA-TP-2505] N86-16041
Wavelength error analysis in a multiple-beam Fizeau laser wavemeter having a linear diode array readout
[NASA-TM-87614] N86-16089

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER, CLEVELAND, OHIO.
Dynamic response of film thickness in spiral-groove face seals
[NASA-TP-2544] N86-15313
Thermal-mechanical fatigue test apparatus for metal matrix composites and joint attachments
[NASA-TM-87187] N86-15378
Creep rupture behavior of Stirling engine materials
[NASA-TM-87209] N86-15380
Textured carbon on copper: A novel surface with extremely low secondary electron emission characteristics
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The application of diffusion theory to the analysis of hydrogen desorption data at 25 deg C
[NASA-TM-86531] N86-15359
Auroral thermosphere temperatures from observations of 6300 A emissions
[NASA-TM-86530] N86-15755
NASA/MSFC FY-85 Atmospheric Processes Research Review
[NASA-CP-2402] N86-15769
Theoretical and experimental studies of baroclinic processes N86-15770
Theoretical and experimental design studies for the Atmospheric General Circulation Experiment N86-15773
Estimation of precipitation from GOES IR imagery during FGGE: Application to diagnostic studies N86-15775
Deep convection in mesoscale convective systems N86-15782
Storm severity detection (RF) N86-15784
Lightning mapper and the future N86-15786
Space shuttle/mesoscale lightning experiment N86-15787
Optical characteristics of lightning and thunderstorm currents N86-15788
Optical characteristics of lightning N86-15789
Airborne atmospheric electricity experiments N86-15790
Analysis of Doppler lidar data N86-15792
Airborne Doppler lidar activities N86-15793
Response of the mesoscale atmosphere to diabatic heating N86-15794
Severe storm detection with passive 37 Ghz observations N86-15797
Automated mesoscale winds derived from GOES multispectral imagery N86-15798
Satellite passive microwave rain measurement techniques for land and ocean N86-15799
Remote sensing of severe convective storms N86-15800
Mesoscale research activities with the LAMPS model N86-15803
Numerical simulation of convective response to mesoscale forcing N86-15806
Improved satellite retrievals and mesoscale moisture variability N86-15812
Studies of humid continental haze during SPACE N86-15813
Interactive information processing for NASA's mesoscale analysis and space sensor program N86-15817
Doppler wind profile experiment N86-15818
Multispectral atmospheric mapping sensor of mesoscale water vapor features N86-15819
First Meeting of the Working Group on the Shuttle Microwave Precipitation Radiometer (SMPR) N86-15820

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Numerical methods N86-15259

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Dynamic characteristics of air data sensor systems: Altimeter, speedometer and alpha times beta vane
[NAL-TR-852] N86-15312

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Three-axis electrofluidic angular rate sensor for ejection seat steering thrust vector control
[AD-A159413] N86-15277

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A comparison of the effects of circuit weight training on men and women
[AD-A159419] N86-15910

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A conservation law related to Kelvin's circulation theorem
[AD-A157819] N86-15631

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Description, analysis, and prediction of sea-floor roughness using spectral models
[AD-A158000] N86-15846

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Considerations for the design and implementation of a management support system for the Electronic Warfare System Support Laboratory
[AD-A158978] N86-15325
Preliminary results of velocities and deceleration of aluminum, magnesium, zirconium, tantalum, pyrofuze and titanium particles burning in steam
[AD-A159141] N86-15365
Burning time and size of aluminum, magnesium, zirconium, tantalum, and pyrofuze particles burning in steam
[AD-A159161] N86-15366
An examination of some error correcting techniques for continuous speech recognition technology
[AD-A158001] N86-15521
Detection of periodic signal of arbitrary shape with random time delay
[AD-A158979] N86-15524
A variance detector for signal-gap discrimination in noisy speech channels
[AD-A159227] N86-15527
Integrated Services Digital Network (ISDN)
[AD-A159578] N86-15531
Silicon compiler design of combinational and pipeline adder integrated circuits
[AD-A158995] N86-15555
VLSI (Very Large Scale Integrated) design of a sixteen bit pipelined multiplier using three micron NMOS technology
[AD-A159433] N86-15557
Use of space shuttle photography in the study of meteorological phenomena
[AD-A159415] N86-15826

Single station assessment of atmospheric boundary layer properties in the eastern Mediterranean Sea
[AD-A159432] N86-15827
Mizlant 84 data report results of an oceanographic cruise to the Greenland Sea, August-September 1984
[AD-A157997] N86-15845
Wave and surf forecast model evaluation for use on a micro computer
[AD-A159063] N86-15848
Temporal and spatial distributions of Arctic Sea ice thickness and pressure ridging statistics
[AD-A159577] N86-15849
Managing computer systems development: Understanding the human and technological imperatives
[AD-A158976] N86-15917
An interactive discrete controls analysis option (ORACLS) for the CONTROLS analysis package on the IBM 3033
[AD-A158754] N86-15956
Implementation of a serial delay insertion type loop communication for a real time multitransputer system
[AD-A158980] N86-15960
Relational programming: Design and implementation of a prototype interpreter
[AD-A159404] N86-15962
The design and analysis of a stylized natural grammar for an object-oriented language (OMEGA)
[AD-A159434] N86-15964
An implementation in Pascal: Translation of Prolog into Pascal
[AD-A159552] N86-15965
Laplacian smoothing splines with generalized cross validation for objective analysis of meteorological data
[AD-A159336] N86-16006
Localization of buried objects in water-saturated sand by variable incidence acoustic pulse reflections
[AD-A158064] N86-16043
Optimum frequency for propagation of sound in shallow sound channels
[AD-A159064] N86-16047
Observation of microwave Cerenkov radiation as diffraction pattern
[AD-A159337] N86-16057

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[AD-A158465] N86-15523
Transverse motion of high speed barium clouds in the ionosphere
[AD-A159058] N86-15760
Nonlinear analysis of a relativistic beam-plasma cyclotron instability
[AD-A159159] N86-16115

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An algorithm for active adaptive control of periodic interference
[AD-A156651] N86-16052

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Corrosion resistant magnesium-based materials for naval applications
[AD-A158012] N86-15351

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Visual display parameters
[AD-A158773] N86-15654

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Hydrodynamic noise and surface compliance--an overview of the Naval Underwater Systems Center IR/IED program
[AD-A157799] N86-15630
The Dowling wall pressure-spectrum analogy applied to an isotropic two-layered elastic medium
[AD-A158009] N86-15632

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Implementation of multifunction information systems at three Navy facilities
[AD-A157797] N86-16153

NEW MEXICO UNIV., ALBUQUERQUE.
Ultrasensitive detection of chemical substances
[AD-A158224] N86-15363
Modeling of concrete, soil, and interfaces
[AD-A158062] N86-15432

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Atmospheric Modeling And Sensor Simulation (AMASS) study N86-15815

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Properties of the internal wave field on the equator N86-15839
Extreme value theory and dependence
[AD-A159138] N86-16001
On determining the predictor of Non-Full-Rank multivariate stationary random processes
[AD-A159165] N86-16024
Fundamental studies and device development in beta silicon carbide
[AD-A159446] N86-16132

NORTH CAROLINA UNIV., CHAPEL HILL.
Microstructures built from electroactive polymers: Toward a macromolecular electronics
[AD-A159430] N86-15400
Redox capacity and dc electron conductivity in electroactive materials
[AD-A159431] N86-15401
Micron-spaced platinum interdigitated array electrode: Fabrication, theory and initial use
[AD-A159429] N86-15556
Stochastic differential equations for neuronal behavior
[AD-A159099] N86-15908
Stochastic integration for operator valued processes on Hilbert spaces and on nuclear spaces
[AD-A158878] N86-16014
Degenerate multivariate stationary processes: Basicity, past and future, and autoregressive representation
[AD-A158879] N86-16015
On the number of bootstrap simulations required to construct a confidence interval
[AD-A158880] N86-16016
Stochastic integrals and processes with independent increments
[AD-A158939] N86-16017
On the angle for stationary random fields
[AD-A158982] N86-16018

NORTH DAKOTA STATE UNIV., FARGO.
Application of the system identification technique to goal-directed saccades
[AD-A159102] N86-15909

NORTHWESTERN UNIV., EVANSTON, ILL.
X-ray elastic constants and their meaning for Al and Fe
[AD-A158251] N86-15382
Profile fitting in residual stress determination
[AD-A158881] N86-15691
Enhancing visual sensitivity
[AD-A158799] N86-15906

O

OAK RIDGE GASEOUS DIFFUSION PLANT, TENN.
Modeling network data structures in relational-like data base management systems
[DE85-015803] N86-16156

OAK RIDGE NATIONAL LAB., TENN.
Time dependent rate theory for diffusional defect processes
[ORNL-6122] N86-15355
A cascade diffusion theory of sink capture fluctuations during irradiation of a solid
[ORNL-6123] N86-15356
Freezing of living cells
[DE85-016297] N86-15862
Hypercube concurrent computation and virtual time for robotic application
[DE85-009479] N86-15979
First-principles calculation of the magnetic properties of paramagnetic fcc iron
[DE85-017155] N86-16035
Improving neutron reaction data through linac-based flight-time spectrometry
[DE85-016417] N86-16062
Intense e-beam interaction with matter
[DE85-017093] N86-16063
Self-consistent electronic structure of alpha-phase Hume-Rothery electron compound
[DE85-017560] N86-16080
Spin dynamics of a Cu-Mn spin glass alloy
[DE85-016295] N86-16134
Vitamin-E 174N,38G general purpose cross-section library
[DE85-013110] N86-16161

OAK RIDGE Y-12 PLANT, TENN.
Computer-assisted program design
[DE85-015315] N86-15973

OAW, VIENNA (AUSTRIA).
Search for the Xi(2220) at Lear
[DE85-014329] N86-16070

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Numerical solutions of two-dimensional reference test cases N86-15262
Parasitic and interference drag prediction and reduction N86-15272

OHIO STATE UNIV., COLUMBUS.
Combined mode 1 - mode 3 fracture toughness of high-strength low-alloy steel N86-15376
An experimental study of an ultra-mobile vehicle for off-road transportation. Appendix 2. Dissertation. Kinematic optimal design of a six-legged walking machine
[AD-A159147] N86-15434
Ultrasonic characterization of porosity using the Kramers-Kronig relations
[DE85-017346] N86-16051

OLD DOMINION UNIV., NORFOLK, VA.
Studies on the interference of wings and propeller slipstreams N86-15241
Chemoviscosity modeling for thermosetting resins
[NASA-CR-176409] N86-15395

OREGON STATE UNIV., CORVALLIS.
Towed thermistor chain observations during MILDEX (Mixed Layer Dynamics Experiment)
[AD-A158304] N86-15847

OSAKA CITY UNIV. (JAPAN).
Investigation of diode physics using an annular magnetically insulated ion diode operated in long pulse mode N86-16097
Operation at high voltage and power brightness of ion beam on conical pinched electron beam diode N86-16105
Spin dynamics of a Cu-Mn spin glass alloy
[DE85-016295] N86-16134

OSAKA UNIV. (JAPAN).
Generation of ion beams in plasma focus N86-16102

OXFORD UNIV. (ENGLAND).
Nonlinear diffusion equations
[AD-A158305] N86-15992

P

PACIFIC NORTHWEST LAB., RICHLAND, WASH.
LANDSAT TM image data quality analysis for energy-related applications
[E86-10009] N86-15703
Approach to uncertainty assessment for fluid flow and contaminant transport modeling in heterogeneous groundwater systems
[DE85-016621] N86-15714
Radiation effects in actinide host phases
[DE85-016273] N86-16075
Assurance Program for Remedial Action (APRA) microcomputer-operated bibliography management system
[DE85-008763] N86-16155

PACIFIC-SIERRA RESEARCH CORP., LOS ANGELES, CALIF.
Experiments in long-wavelength communication using modulated electron beam antennas: A parameter study
[AD-A157810] N86-15519

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
The use of satellite data in understanding and predicting convective and large-scale dynamical processes N86-15776

PENNSYLVANIA UNIV., PHILADELPHIA.
Research in adaptive beamforming for satellite communications
[AD-A157828] N86-15520

PHYSICS AND ELECTRONICS LAB. TNO, THE HAGUE (NETHERLANDS).
The design of a Rotman lens
[FEL-1985-13] N86-15537
Programs to compute the Circular Error Probability (CEP) of a location system with direction finding stations
[FEL-1985-20] N86-15538

PITTSBURGH UNIV., JOHNSTOWN, PA.
On the matrix convexity of the Moore-Penrose inverse and some applications
[AD-A158992] N86-16019
Inadmissibility of the best equivariant estimators of the variance-covariance matrix and the generalized variance under entropy loss
[AD-A159059] N86-16020

PITTSBURGH UNIV., PA.
Shift-variant multidimensional systems
[AD-A158973] N86-15998
Strong representation of weak convergence
[AD-A159078] N86-16000
Non-uniform bounds of normal approximation for finite-population U-statistics
[AD-A159163] N86-16003

POLITECNICO DI MILANO (ITALY).
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POLYTECHNIC OF CENTRAL LONDON (ENGLAND).
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PRATT AND WHITNEY AIRCRAFT, EAST HARTFORD, CONN.
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[NASA-CR-168267] N86-15651
PRINS MAURITS LAB. TNO, RIJSWIJK (NETHERLANDS).
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[PML-1985-3-PT-1] N86-15649
PURDUE UNIV., WEST LAFAYETTE, IND.
Utilization of satellite cloud information to diagnose the energy state and transformations in extratropical cyclones N86-15778
Dynamics and energetics of the South Pacific Convergence Zone during FGGE SOP-1 N86-15779
Multiple decision procedures for Tukey's generalized lambda distributions
[AD-A159153] N86-16021
On the least favorable configuration of a selection procedure based on ranks
[AD-A159154] N86-16022
A lower confidence bound on the probability of a correct selection
[AD-A159164] N86-16023

Q

QUEENSLAND UNIV., BRISBANE (AUSTRALIA).
Scramjet sidewall burning: Preliminary shock tunnel results
[NASA-CR-176420] N86-15337

R

RAND CORP., SANTA MONICA, CALIF.
Running ROSS in an Emacs environment
[AD-A159567] N86-15966
RAYTHEON CO., WALTHAM, MASS.
Optimization of a magnet circuit design for a cylindrical mass spectrometer
[NASA-CR-176400] N86-15543
RENSSELAER POLYTECHNIC INST., TROY, N.Y.
Early transonic ideas in the light of later developments
[AD-A159101] N86-15250
Electrical characteristics of Si devices fabricated with completely consumed carbide (C3) dielectric isolation process
[AD-A158296] N86-15547
Completely consumed carbide (C3) - A new process for dielectric isolation
[AD-A158298] N86-15548
Numerical methods for singularly perturbed differential equations with applications
[AD-A158969] N86-15997
RESEARCH INST. OF NATIONAL DEFENCE, STOCKHOLM (SWEDEN).
Visibility of noise in homogeneous and textured areas
[FOA-C-50010-H2] N86-15536
The seismicity of southern Sweden, 1979 - 1984
[FOA-C-20572-TI] N86-15765
RESEARCH TRIANGLE INST., RESEARCH TRIANGLE PARK, N.C.
Collection and analysis of NASA clean room air samples
[NASA-CR-3947] N86-15358
RHODE ISLAND UNIV., KINGSTON.
Structure and tectonics of the Long Island platform N86-15752
Observations of equatorially trapped waves in the eastern Atlantic Ocean from inverted echo sounders N86-15840
Dynamics and structure of Gulf Stream meanders northeast of Cape Hatteras, N.C. N86-15841
Teh carbon dioxide system and its role on trace metal chemistry in the marine environment N86-15843
RICE UNIV., HOUSTON, TEX.
Radiation pressure and the geocorona N86-15749
Search for the XI(2220) at Lear
[DE85-014329] N86-16070
ROCK ISLAND ARSENAL, ILL.
Stress analysis on screw thread
[AD-A159347] N86-15693
ROCKWELL INTERNATIONAL CORP., DOWNEY, CALIF.
Advanced Integrated Power and Attitude Control System (IPACS) study
[NASA-CR-3912] N86-15338
ROCKWELL INTERNATIONAL CORP., GOLDEN, COLO.
Proving ring calibrations using a deadweight pressure system
[RFP-3677] N86-15650
ROCKWELL INTERNATIONAL SCIENCE CENTER, THOUSAND OAKS, CALIF.
Research on the crystal growth and dielectric properties of high permittivity ferroelectric materials
[AD-A157820] N86-16126
ROME UNIV. (ITALY).
Correlations between signals from gravitational wave antennas in Rome and in Geneva
[PREPRINT-462] N86-15533
Three families of integrable one-particle potentials
[PREPRINT-440] N86-16007
Some solvable dynamical systems
[PREPRINT-441] N86-16008
Backlund transformations: Tools to find novel integrable evolution equations
[PREPRINT-443] N86-16009
Connectance and equipartition thresholds in hamiltonian systems
[PREPRINT-445] N86-16010
Nonlinear evolution equations associated with a Riemann-Hilbert scattering problem
[PREPRINT-458] N86-16030
Relation between the supertableaux of the supergroups orthosymplectic OSP (2 2) and superunity SU (1 2)
[PREPRINT-459] N86-16031
Does one need a fourth generation of leptons
[PREPRINT-461] N86-16071
Nucleon structure functions from neutrino scattering
[NOTA-INTERNA-851] N86-16072
Self-consistent approximation for squeezing generation in a nonlinear optical medium
[NOTA-INTERNA-845] N86-16094
Statistical model for the trapping of interstitials by substitutional (interstitial) atoms in solids
[PREPRINT-442] N86-16141
Metal-insulator transition and Landau Fermi liquid theory
[NOTA-INTERNA-844] N86-16142
Corrections to universal scaling for the 2D nonlinear sigma model on the lattice
[PREPRINT-460] N86-16145
Path integral approach to birth-death processes on a lattice
[NOTA-INTERNA-843] N86-16146
Stochastic theory of emission and absorption of quanta
[NOTA-INTERNA-847] N86-16147
ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH (ENGLAND).
A rapid method for estimating equivalent parabolic polars from wind-tunnel tests
[AD-A159559] N86-15251
Numerical solutions for three-dimensional cases: Delta wings N86-15264
Prediction of the drag of wings at subsonic speeds by viscous/inviscid interaction techniques N86-15274
ROYAL INST. OF TECH., STOCKHOLM (SWEDEN).
Preliminary study on the control of a direct injection diesel engine for better fuel flexibility and emissions control, parts 1 and 2
[TRITA-REG-8501] N86-15673
Cosmogonic scenario
[TRITA-EPP-85-04] N86-16175
Further explorations of cosmogonic shadow effects in the Saturnian rings
[NASA-CR-176441] N86-16177
ROYAL MILITARY COLL. OF SCIENCE, SHRIVENHAM (ENGLAND).
Investigations and comparisons of new types of millimetre-wave planar arrays using microstrip and dielectric structures
[AD-A158313] N86-15522
ROYAL NETHERLANDS METEOROLOGICAL INST., DE BILT.
Climatological data of stations in the Netherlands. No. 24: A climatology of Amsterdam airport for the period 1951 - 1980
[KNMI-150-24] N86-15837
An operational wave model for the North Atlantic Ocean
[KNMI-WR-85-3] N86-15857
The effect of the wind in the Eemsmond (the Netherlands, West Germany) on high tide levels in Delfzijl (the Netherlands)
[KNMI-TR-63] N86-15858
ROYAL NORWEGIAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH, KJELLER.
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[AD-A159129] N86-15761
ROYAL SIGNALS AND RADAR ESTABLISHMENT, MALVERN (ENGLAND).
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[AD-A159558] N86-15828
RUHR UNIV., BOCHUM (WEST GERMANY).
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[RUB-IFM-MITT-45] N86-15982

S

SAINT LOUIS UNIV., MO.
A summary of research on mesoscale energetics of severe storm environments N86-15807
Statistical analysis and use of VAS radiance data N86-15811
SAN FRANCISCO UNIV., CALIF.
Radiation mapping on Spacelab 1: Experiment no. INS006
[NASA-CR-171893] N86-15332
SANDIA LABS., ALBUQUERQUE, N. MEX.
Configurational diffusion in semidilute solutions
[DE85-017121] N86-15405
Extension of electronic transport properties of polymer dielectrics to severe environments encountered in systems
[DE85-017321] N86-15406
DAASY (data acquisition and analysis system)
[DE85-016341] N86-15971
Comparison of 2D memory SEU transport simulations with experiments
[DE85-016134] N86-16137
Heterogeneous response of aluminum and lithium niobate to shock waves
[DE85-013963] N86-16140
SANDIA NATIONAL LABS., ALBUQUERQUE, N. MEX.
The effect of environmental stress on Sylgard 170 silicone elastomer
[TI85-013268] N86-15407
Spectroscopic studies of detonating heterogeneous explosives
[DE85-007687] N86-15419
Finite-difference electrodynamic analysis of a tapering coaxial waveguide incorporating a dielectric wedge-shaped lens for concentrating Transverse Electromagnetic (TEM) waves
[SAND-84-2062] N86-15517
Development of a photonic data recorder
[DE85-017120] N86-15655
Determining probabilities of geologic events and processes
[TI85-014642] N86-15762
PETROS: A progam for calculating transport of heat, water, water vapor and air through a porous material
[DE85-013168] N86-15972
IFA-2 collective ion accelerator experiments
[DE85-012358] N86-16067
Significance of single particle effects in neutral beam weapon lethality
[DE85-012031] N86-16068
PBFA-2 vacuum system design using a lumped parameter computer model
[DE85-013117] N86-16125
SABIRS: User reference and system documentation
[DE85-016801] N86-16157
Search for positron annihilation line and continuum radiation from the Galactic Center
[DE85-013964] N86-16169
SCHOOL OF AEROSPACE MEDICINE, BROOKS AFB, TEX.
Potency of photoflash-produced retrograde amnesia in rats
[AD-A159149] N86-15859
SCIENCE RESEARCH CORP., CAMBRIDGE, MASS.
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[DE85-016066] N86-16093
SEOUL NATIONAL UNIV. (SOUTH KOREA).
A lower confidence bound on the probability of a correct selection
[AD-A159164] N86-16023
SHEFFIELD UNIV. (ENGLAND).
Progress on combined load- and profile-control for horizontal-turret, single- and double-arm tunnelling machines
[RR-276] N86-15674
On the optimal control of bilinear systems and its relation to Lie algebras
[RR-275] N86-15980
On the optimal control of nonlinear systems
[RR-278] N86-15981
Introduction to nonlinear systems analysis and identification
[RR-277] N86-16029
SIKORSKY AIRCRAFT, STRATFORD, CONN.
Test results from a dynamic model dynaflex rotor N86-15285

Development and application of a time-history analysis for rotorcraft dynamics based on a component approach N86-15291

An examination of the relations between rotor vibratory loads and airframe vibrations N86-15299

Adaptation of a modern medium helicopter (Sikorsky S-76) to higher harmonic control N86-15303

SIMPSON WEATHER ASSOCIATES, INC., CHARLOTTESVILLE, VA.

Multiscale modeling to evaluate proposed space-based Doppler lidar sampling strategies N86-15774

SOFTECH, INC., FAIRBORN, OHIO.

Ada (trade name) compiler validation summary report: Rational environment, version A.2.0.6 for rational R1000 [AD-A157830] N86-15949

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SPARTA, INC., MCLEAN, VA.

Specific recommendations for improving network feedback to hosts [AD-A158768] N86-15924

SPECTRON DEVELOPMENT LABS., INC., COSTA MESA, CALIF.

Droplet sizing research [AD-A158318] N86-15653

SPIRE CORP., BEDFORD, MASS.

Improved lifetime high voltage switch electrode [AD-A158961] N86-15554

SRI INTERNATIONAL CORP., MENLO PARK, CALIF.

Computer vision research and its applications to automated cartography [AD-A159435] N86-15713

ST/E TECHNICAL SERVICES, INC., SAN RAMON, CALIF.

Micro-Raman spectroscopy: The analysis of micrometer and submicrometer atmospheric aerosols [NASA-CR-177964] N86-15756

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Computational needs for modelling accelerator components [DE85-015262] N86-16082

Isolated data acquisition system for high voltage applications [DE85-016984] N86-16116

STANFORD UNIV., CALIF.

Host groups: A multicast extension for datagram internetworks [AD-A159146] N86-15526

Novel approaches to passivation of Si for VHSIC - based on fundamental studies [AD-A158238] N86-15546

Computational models of human vision with applications [NASA-CR-176413] N86-15898

Database theory [AD-A158975] N86-15925

Constructing a perfect matching is in Random NC [AD-A157813] N86-15988

Tests for a change-point [AD-A159381] N86-16025

STANFORD UNIV., PALO ALTO, CALIF.

Random sequential coding by hamming distance [AD-A158003] N86-15989

STATE UNIV. OF NEW YORK, STONY BROOK.

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STATE UNIV. OF NEW YORK, SYRACUSE.

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SWEDISH MOTOR FUEL TECHNOLOGY CO., STOCKHOLM.

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SYDNEY UNIV. (AUSTRALIA).

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SYRACUSE UNIV., N. Y.

The LOGLISP programming system [AD-A158011] N86-15950

SYSTEMS CONTROL, INC., WEST PALM BEACH, FLA.

VHF-AM communications equipment selection and installation practices for helicopters [DOT/FAA/PM-85/8] N86-15518

T

TECHNION - ISRAEL INST. OF TECH., HAIFA.

Evolution of nonlinear wave groups on water of slowly-varying depth [AD-A158860] N86-15635

TECHNISCHE HOGESCHOOL, DELFT (NETHERLANDS).

The flapping movement and frequency of rotating windmill wings defined with a differential equation [IW-R501] N86-15255

Triple pendulum for the demonstration of nonlinear coupling [LAB-REPT-763] N86-16032

Triple pendulum for the demonstration of nonlinear coupling N86-16033

TECHNISCHE HOGESCHOOL, TWENTE (NETHERLANDS).

Investigation of the friction of Becorit 820 versus cast iron [WB-83/TRI-10053] N86-15675

TECHNISCHE UNIV., BERLIN (WEST GERMANY).

Investigations of the relations between the damage evolution of vibrationally loaded samples and the measuring quantities of the instrumented accelerated fatigue test during the crackfree fatigue phase and microcrack formation phase N86-15694

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Real-time digital terrain image generator [AD-A159316] N86-15327

TENNESSEE UNIV., KNOXVILLE.

A general model for the homogeneous case of the continuous response [AD-A159345] N86-15914

Self-consistent electronic structure of alpha-phase Hume-Rothery electron compound [DE85-017560] N86-16080

TETRA TECH, INC., ARLINGTON, VA.

A target tracker using a Doppler compensated correlation technique [AD-A158087] N86-15990

TEXAS A&M UNIV., COLLEGE STATION.

One-dimensional iterative inversion of vertical seismic profiles N86-15748

Application of satellite data to tropic/subtropic moisture coupling N86-15780

A study of data entry keyboards: The 4 x 4 keypad [AD-A159095] N86-15926

TEXAS UNIV., AUSTIN.

The equal flow problem [AD-A159594] N86-16028

The experimental investigation of the inverse problem in rough surface scattering of acoustic waves [AD-A158070] N86-16044

The broadband normal mode model PROTEUS [AD-A159091] N86-16048

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A computer program for analyzing loglinear models with latent variaoles: LCAG N86-16026

TOKYO INST. OF TECH., YOKAHAMA (JAPAN).

Experiments on cryogenic pulsed ion sources N86-16098

Analysis of microscopic instability for rotating LIB N86-16106

Simulation of ion-beam in MID N86-16107

Numerical analysis for current neutralization of rotating light ion beam N86-16108

Alpha-burning in ICF target N86-16109

Target imposion in LIB ICF N86-16110

Research for thermal behavior of liquid-metal wall in ICF reactor N86-16111

Proposal of power plant by LIB fusion N86-16113

TORONTO UNIV. (ONTARIO).

Laser plus surface-dynamics facility [AD-A158922] N86-15661

A computer model of driver response [UTIAS-293] N86-15911

TRONDHEIM UNIV. (NORWAY).

Formulation of the Euler boundary value problem N86-15258

U

UNITED KINGDOM ATOMIC ENERGY AUTHORITY, RISLEY (ENGLAND).

TiN hard coating by reactive ion-plating [BLL-RISLEY-TR-5112-(9091.9F)] N86-15371

UNITED TECHNOLOGIES RESEARCH CENTER, EAST HARTFORD, CONN.

Analysis of potential helicopter vibration reduction concepts N86-15302

Coupled high power waveguide laser research [AD-A159079] N86-15682

UNIVERSAL ENERGY SYSTEMS, INC., DAYTON, OHIO.

DLTS (Deep-Level Transient Spectroscopy) analysis of germanium and Al sub x Ga sub 1-x As solar cells [AD-A159114] N86-15732

Demonstrate capabilities of digital graphics system to obtain quantitative information from flow visualization data [AD-A158760] N86-15923

UNIVERSITIES SPACE RESEARCH ASSOCIATION, RAPID CITY, S.D.

Mesoscale: Cloud scale simulation of convective response N86-15802

UNIVERSITY COLL. OF NORTH STAFFORDSHIRE, KEELE (ENGLAND).

Prosodic analysis by rule [BR94770] N86-15516

UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES.

Basic research in reliability for real systems [AD-A159100] N86-15681

Programming productivity enhancement by the use of application generators by the use of application generators [AD-A158590] N86-15953

Further informational properties of the Nash and Stackelberg solutions of LQG games [AD-A158569] N86-15993

Subnanosecond short wavelength generation using optical fibers [AD-A158769] N86-16090

UPPSALA IONOSPHERIC OBSERVATORY (SWEDEN).

Lower hybrid parametric processes on auroral field lines in the topside ionosphere [UIO-SR-85-03] N86-15764

UPPSALA UNIV. (SWEDEN).

Search for the XI(2220) at Lear [DE85-014329] N86-16070

V

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.

Effects of load proportioning on the capacity of multiple-hole composite joints [NASA-CR-178019] N86-15687

W

WAGENINGEN AGRICULTURAL UNIV. (NETHERLANDS).

Image registration N86-15718

WARWICK UNIV. COVENTRY (ENGLAND).

First-principles calculation of the magnetic properties of paramagnetic fcc iron [DE85-017155] N86-16035

WASHINGTON STATE UNIV., PULLMAN.

Rapidly convergent algorithms for nonsmooth optimization [AD-A159168] N86-16005

WASHINGTON UNIV., SEATTLE.

Geology, petrology, and geochemistry of a younger granite pluton, central Eastern Desert of Egypt; importance of mixing N86-15746

Problem solving under time-constraints [AD-A158921] N86-15957

Superconducting resonators for the University of Washington booster linac [DE85-017419] N86-16124

WASHINGTON UNIV., ST. LOUIS, MO.

Coupled rotor-body vibrations with inplane degrees of freedom N86-15301

WEIZMANN INST. OF SCIENCE, REHOVOTH (ISRAEL).

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Fracture toughness testing of laser welds in 2 mm thick titanium alloy IMI 550 [REPT-3784/1/85] N86-15685

WESTINGHOUSE DEFENSE AND ELECTRONIC SYSTEMS CENTER, BALTIMORE, MD.

Acceptance test plan for broadband microwave amplifier panel [AD-A159450] N86-15558

WESTLAND HELICOPTERS LTD., YEOVIL (ENGLAND).

Elastohydrodynamic studies using thin film transducers [RP-666] N86-15648

WISCONSIN UNIV., MADISON.

Photoluminescent response of palladium-cadmium sulfide and palladium-graded cadmium sulfoselenide Schottky diodes to molecular hydrogen [AD-A158759] N86-15552

Studies of lightning data in conjunction with geostationary satellite data N86-15785

Mesoscale ageostrophic circulations associated with baroclinic jet streaks N86-15795
Cooperative VAS program with NASA Marshall Space Flight Center N86-15804
The assimilation of satellite soundings, winds and satellite products in a mesoscale analysis forecast system N86-15805
Detection of rotating thunderstorms using satellite imagery N86-15810
A design study for a three-dimensional display computer terminal for meteorological information N86-15816
Severe storm identification with satellite microwave radiometry: An initial investigation with Nimbus-7 SMMR data
[NASA-CR-176431] N86-15821
Satellite microwave observations of a storm complex: A comparative analysis
[NASA-CR-176430] N86-15822
Thin superconducting film characterization by surface acoustic waves
[AD-A158311] N86-16127

WISCONSIN UNIV., MILWAUKEE.
Sieves and a filter for Gaussian processes
[AD-A158762] N86-15994

WORCESTER POLYTECHNIC INST., MASS.
Environmental considerations and waste planning on the lunar surface: An interactive qualifying N86-15331

WYOMING UNIV., LARAMIE.
Mechanical properties testing of candidate polymer matrix materials for use in high performance composites
[NASA-CR-177970] N86-15349

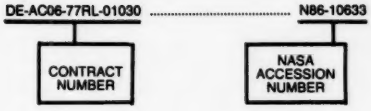
Y

YALE UNIV., NEW HAVEN, CONN.
Observational and theoretical studies of the evolving structure of baroclinic waves: Attractor dynamics of global weather systems N86-15781
Distributed FIFO allocation of identical resources using small shared space
[AD-A159151] N86-15978
Droplet size and evaporation rate within a two-phase flow by morphology-dependent resonances in the optical spectra
[AD-A158931] N86-16091
Probabilistic analysis of a network resource allocation algorithm. Revision
[AD-A158970] N86-16150

YALE UNIV. OBSERVATORY, NEW HAVEN, CONN.
Dynamic monotone priorities on planar sets (extended abstract)
[AD-A158610] N86-15955

YORK COLL., JAMAICA, N. Y.
Cosmogenic neutron-capture-produced nuclides in stony meteorites
[DE85-012689] N86-16170

Typical Contract Number Index Listing

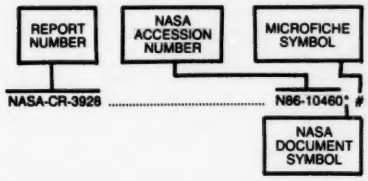


Listings in this index are arranged alphanumerically by contract number. Under each contract number the NASA accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order. The NASA accession number denotes the number by which the citation is identified.

AF PROJ. 2301 ..... N86-15659
AF PROJ. 2305 ..... N86-15519
AF PROJ. 2309 ..... N86-15761
AF PROJ. 5730 ..... N86-15684
AF PROJ. 7231 ..... N86-15328
AF PROJ. 7757 ..... N86-15859
AF-AFOSR-0005-84 ..... N86-16030
AF-AFOSR-0030-84 ..... N86-15907
AF-AFOSR-0038-83 ..... N86-15998
AF-AFOSR-0084-83 ..... N86-15414
AF-AFOSR-0095-80 ..... N86-16166
AF-AFOSR-0155-82 ..... N86-15250
AF-AFOSR-0167-82 ..... N86-15529
AF-AFOSR-0174-82 ..... N86-15993
AF-AFOSR-0187-82 ..... N86-15996
AF-AFOSR-0192-80 ..... N86-15997
AF-AFOSR-0210-83 ..... N86-16005
AF-AFOSR-0212-80 ..... N86-15925
AF-AFOSR-0230-82 ..... N86-15999
AF-AFOSR-0232-82 ..... N86-15953
AF-AFOSR-0246-80 ..... N86-15906
AF-AFOSR-0269-84 ..... N86-15681
AF-AFOSR-0278-83 ..... N86-16028
AF-AFOSR-0329-84 ..... N86-15994
AF-AFOSR-0350-84 ..... N86-16127
ARPA ORDER 2309 ..... N86-15761
ARPA ORDER 3862 ..... N86-15713
ARPA ORDER 4507 ..... N86-15363
ARPA ORDER 5378 ..... N86-15959
A76/KM/134 ..... N86-15676
A81/KL/134 ..... N86-15538
BMVG-GF-83/84-SUK-4.2 ..... N86-16039
BMVG-GF-84/SUK-2.5 ..... N86-16038
DA PROJ. RR0-2102 ..... N86-16132
DA PROJ. RR0-4204 ..... N86-15914
DA PROJ. Z08-38 ..... N86-15416
DA PROJ. 1L1-61102-AH-43 ..... N86-15368
N86-16369
DA PROJ. 1L1-61102-BH-57 ..... N86-15635
DA PROJ. 1L1-62618-AH-80 ..... N86-15961
DA PROJ. 1L1-62622-A-554 ..... N86-15636
DA PROJ. 1T1-61102-BH-57 ..... N86-15522
N86-15549
N86-15992
DA PROJ. 3E1-62777-A-879 ..... N86-15904
DA PROJ. 136-6 ..... N86-15310
DA PROJ. 210-3 ..... N86-15326
DA PROJ. 241-8 ..... N86-15383
DA P2402 ..... N86-15413
DAAD05-83-M-H723 ..... N86-15926
DAAG29-79-C-0155 ..... N86-15978
N86-16150
DAAG29-81-C-0038 ..... N86-15550
DAAG29-81-K-0136 ..... N86-16027
DAAG29-82-K-0087 ..... N86-15546
DAAG29-84-K-0058 ..... N86-16150
DAAH01-82-D-A016 ..... N86-15666
DAAK11-83-C-0009 ..... N86-15327
DAAK70-79-D-0087 ..... N86-16150
DAAK70-83-K-0018 ..... N86-15901
DAJA37-81-C-0220 ..... N86-15992
DAJA37-81-C-0895 ..... N86-15758
DAJA37-82-C-0181 ..... N86-15549
DAJA37-82-C-0300 ..... N86-15635
DAJA45-83-C-0054 ..... N86-15522
DAJA45-84-M-0394 ..... N86-16131
DCA100-84-C-0085 ..... N86-15924
DE-AC02-76CH-00016 ..... N86-15860
N86-16086
DE-AC02-76CH-03000 ..... N86-16077
N86-16078
N86-16079
N86-16116
N86-16117
N86-16168
DE-AC02-76ET-53016 ..... N86-16122
DE-AC02-76EV-04746 ..... N86-15861
DE-AC02-83CH-10093 ..... N86-15656
N86-15735
N86-15738
N86-16135
DE-AC03-76SF-00098 ..... N86-15637
N86-16064
N86-16066
N86-16069
N86-16085
N86-16121
DE-AC03-76SF-00515 ..... N86-16082
DE-AC03-84ER-80189 ..... N86-15901
DE-AC04-76DP-00053 ..... N86-15403
N86-15969
N86-16171
DE-AC04-76DP-00613 ..... N86-15388
DE-AC04-76DP-00789 ..... N86-15405
N86-15406
N86-15407
N86-15418
N86-15419
N86-15655
N86-15734
N86-15762
N86-15971
N86-15972
N86-16067
N86-16068
N86-16125
N86-16137
N86-16140
N86-16157
N86-16169
DE-AC04-76DP-03533 ..... N86-15650
DE-AC05-84OR-21400 ..... N86-15356
N86-15390
N86-15862
N86-15973
N86-15979
N86-16035
N86-16062
N86-16063
N86-16080
N86-16134
N86-16161
DE-AC05-84OT-21400 ..... N86-16156
DE-AC06-76FF-02170 ..... N86-15384
DE-AC06-76RL-01380 ..... N86-16155
DE-AC06-76RL-01830 ..... N86-15714
N86-16075
DE-AC06-84ER-40124 ..... N86-16124
DE-AI01-77CS-51044 ..... N86-15380
DE-AI01-79ET-20305 ..... N86-15722
N86-15723
N86-15724
N86-15725
N86-15726
N86-15727
N86-15728
N86-15729
N86-15730
DE-AI01-80CS-50194 ..... N86-16164
DE-AI01-85CE-50112 ..... N86-16165
DE-AI21-83MC-20417 ..... N86-15360
DE-FC03-80SF-11504 ..... N86-15404
DE-FG02-84ER-45116 ..... N86-15387
DE-FG02-84ER-45144 ..... N86-16074
DEN3-153 ..... N86-15722
N86-15723
N86-15724
N86-15725
N86-15726
N86-15727
N86-15728
N86-15729
N86-15730
DEN3-312 ..... N86-16165
DFG-DO-202/11 ..... N86-15684
DNA001-80-C-0022 ..... N86-15545
DNA001-84-C-0288 ..... N86-15519
DOE-DGR-481/176 ..... N86-15850
DOE-DGR-481/178 ..... N86-15745
DOE-DGR-481/179 ..... N86-15855
DRET-83/1180 ..... N86-15657
DTFA01-80-C-10080 ..... N86-15518
DTFA03-80-A-00215 ..... N86-15412
EEC-CL115UK(H) N86-15851
EMW-E-0883 ..... N86-15399
F7T/50377/C N86-15516
F41-400 ..... N86-15277
F41-451 ..... N86-15277
F04701-83-C-0084 ..... N86-15551
N86-15757
N86-16054
N86-16058
N86-16073
F08635-83-C-0067 ..... N86-15415
F19628-84-C-0001 ..... N86-15525
N86-15954
F29601-81-C-0013 ..... N86-15432
F30602-81-C-0024 ..... N86-15950
F30602-83-K-0046 ..... N86-15520
F3360[illegible]-84-D-0280 ..... N86-15949
F3361 79-C-0019 ..... N86-16149
F33615-81-C-2058 ..... N86-15732
F33615-81-K-1539 ..... N86-15952
F33615-83-C-2344 ..... N86-15398
F33615-83-C-3201 ..... N86-15322
F33615-84-C-2481 ..... N86-15923
F49620-81-K-0017 ..... N86-15682
F49620-82-C-0008 ..... N86-16001
F49620-82-C-0009 ..... N86-15908
N86-16014
N86-16015
N86-16016
N86-16017
N86-16018
N86-16024
F49620-82-C-0024 ..... N86-15759
F49620-82-C-0035 ..... N86-15367
N86-15909
F49620-82-K-0005 ..... N86-16091
F49620-83-C-0060 ..... N86-15853
F49620-84-C-0016 ..... N86-16090
F49620-84-C-0062 ..... N86-15662
F49620-84-C-0071 ..... N86-16128
F49620-84-C-0079 ..... N86-16002
F49620-84-C-0100 ..... N86-15920
F49620-84-C-0120 ..... N86-15554
F49620-85-C-0007 ..... N86-16013
F49620-85-C-0008 ..... N86-16000
N86-16003
N86-16019
N86-16020
F49620-85-C-0016 ..... N86-15761
KC-04-03-03-87070 ..... N86-15703
L77/ALG/115 ..... N86-15537
MDA903-81-C-0335 ..... N86-15920
MDA903-81-C-0411 ..... N86-15952
MDA903-82-K-0058 ..... N86-15434
MDA903-83-C-0027 ..... N86-15713
MDA903-84-C-0031 ..... N86-15316
MDA903-85-C-0124 ..... N86-15959
MIN-DEF-A12/1596 ..... N86-15648
MIN-DEF-A91A/971 ..... N86-15648
MIN-DEF-A91A/1149 ..... N86-15685
M00-96-PN N86-15910
NAGW-674 ..... N86-15337
NAG1-277 ..... N86-15349
NAG1-343 ..... N86-15687

NAG1-569 ..... N86-15395
NAG3-85 ..... N86-15323
NAG3-340 ..... N86-16164
NAG3-615 ..... N86-15544
NAG5-391 ..... N86-15821
N86-15822
NASA ORDER L-78258B N86-15358
NASA ORDER S-12402-C N86-15703
NASW-3542 ..... N86-15397
NASW-4004 ..... N86-15314
N86-15379
NASW-4006 ..... N86-15396
N86-15731
NAS1-15325 ..... N86-15305
NAS1-16303 ..... N86-15320
NAS1-16579 ..... N86-15278
NAS1-17070 ..... N86-15628
N86-15629
NAS1-17633 ..... N86-15338
NAS1-17943 ..... N86-15756
NAS2-11979 ..... N86-15334
NAS3-23353 ..... N86-15339
NAS5-27580 ..... N86-15706
NAS5-27595 ..... N86-15711
NAS5-28740 ..... N86-15704
NAS7-918 ..... N86-15249
N86-15333
N86-15360
N86-15412
NAS8-34767 ..... N86-15821
NAS8-34971 ..... N86-15688
N86-15689
NAS9-15337 ..... N86-15332
NATO-SA-5-2-05-RG-919/83 ..... N86-16094
NCB-PSD-19(84) N86-15674
NCC1-88 ..... N86-15680
NCC1-90 ..... N86-15391
NCC2-44 ..... N86-15898
NCC2-308 ..... N86-16054
NR PROJ. 042-373 ..... N86-16025
NSF DCR-83-02391 ..... N86-16150
NSF DMS-82-02117 ..... N86-16030
NSF DMS-82-18191 ..... N86-16020
NSF MCS-77-02474 ..... N86-15978
NSF MCS-77-15628 ..... N86-15978
NSF MCS-79-12179 ..... N86-15948
NSF MCS-79-24370 ..... N86-16150
NSF MCS-80-24519 ..... N86-16025
NSF MCS-81-16678 ..... N86-16150
NSF MCS-81-17633 ..... N86-15948
NSF MCS-82-00854 ..... N86-16150
NSF MCS-83-04190 ..... N86-15920
NSF MCS-83-06854 ..... N86-16150
NSF NCS-83-04567 ..... N86-15963
NSF 83-03325 ..... N86-15963
NSG-1483 ..... N86-15348
NSG-3075 ..... N86-15625
N00014-76-C-0475 ..... N86-15989
N00014-76-C-0745 ..... N86-15341
N86-15342
N00014-76-C-0867 ..... N86-16030
N00014-77-C-0306 ..... N86-16025
N00014-78-C-0633 ..... N86-15552
N00014-79-C-0004 ..... N86-15847
N00014-79-C-0128 ..... N86-15899
N00014-80-C-050 ..... N86-15963
N00014-80-C-0116 ..... N86-15382
N86-15691
N00014-80-C-0490 ..... N86-16044
N00014-80-C-0505 ..... N86-15948
N00014-80-C-0538 ..... N86-15362
N00014-81-C-0463 ..... N86-16126
N00014-81-C-0535 ..... N86-15990
N00014-81-C-0569 ..... N86-15914
N00014-81-C-0692 ..... N86-15530
N00014-81-K-0605 ..... N86-15547
N86-15548
N00014-81-K-0700 ..... N86-15660
N00014-81-K-0809 ..... N86-15665
N00014-81-K-0844 ..... N86-15361
N00014-82-C-0002 ..... N86-16050
N00014-82-K-0154 ..... N86-15955
N86-15978
N86-16150
N00014-82-K-0182 ..... N86-16132
N00014-82-K-0263 ..... N86-15413
N00014-82-K-0295 ..... N86-16028
N00014-82-K-0337 ..... N86-15400
N86-15401
N86-15556
N00014-82-K-0487 ..... N86-15913
N00014-82-K-0690 ..... N86-15363
N00014-83-C-0690 ..... N86-15364
N00014-83-C-0725 ..... N86-15311
N00014-83-C-2157 ..... N86-16055
N00014-83-C-2311 ..... N86-15416
N00014-83-K-0136 ..... N86-15633
N86-15995
N00014-83-K-0346 ..... N86-16048
N00014-83-K-0498 ..... N86-15664
N86-16130
N00014-83-K-2017 ..... N86-16129
N00014-84-C-0032 ..... N86-15381
N00014-84-C-0167 ..... N86-16021
N86-16022
N86-16023
N00014-84-C-0193 ..... N86-16042
N00014-84-C-0218 ..... N86-15847
N00014-84-C-2232 ..... N86-15558
N00014-84-C-2387 ..... N86-15991
N00014-84-G-0184 ..... N86-15661
N00014-84-K-0049 ..... N86-15958
N00014-84-K-0291 ..... N86-15553
N00014-84-K-0553 ..... N86-15553
N00014-84-K-5553 ..... N86-15957
N00039-81-C-0663 ..... N86-16154
N00039-83-C-1036 ..... N86-15988
N00039-83-K-0431 ..... N86-15526
N66314-70-A-0073 ..... N86-15692
N86-16046
N66314-72-A-3029 ..... N86-15433
N86-15921
RR0-1109 ..... N86-16115
RR0-3205 ..... N86-16050
SERC-GR/B/31163 ..... N86-16029
SERC-GR/D/30587 ..... N86-16029
STU-83-4018 ..... N86-15673
W-31-109-ENG-38 ..... N86-15742
N86-15744
N86-16081
N86-16144
W-31-109-ENT-38 ..... N86-15974
W-7405-ENG-36 ..... N86-15385
N86-15737
N86-15967
N86-16036
N86-16065
N86-16118
N86-16119
N86-16120
N86-16136
N86-16138
N86-16159
N86-16160
N86-16170
N86-16173
N86-16176
N86-16184
W-7405-ENG-48 ..... N86-15399
N86-15417
N86-15638
N86-15652
N86-15968
N86-15970
N86-15975
N86-16059
N86-16061
N86-16076
N86-16093
N86-16123
N86-16172
N86-16174
N86-16183
W-7405-ENG-82 ..... N86-15389
N86-16051
N86-16139
377-4 ..... N86-15654
159-41-06 ..... N86-15334
314-40-51-01-03 ..... N86-15333
505-31-01 ..... N86-15244
N86-15246
N86-15626
N86-15627
505-31-33-13 ..... N86-16041
505-31-83-01 ..... N86-15628
N86-15629
505-33-33-02 ..... N86-15349
505-33-62 ..... N86-15378
505-33-78 ..... N86-15313
505-33-90-02 ..... N86-16040
505-34-13-12 ..... N86-15278
505-40-90-01 ..... N86-15248
505-42-11 ..... N86-15280
505-42-11-04-55 ..... N86-15249
505-63-01-06 ..... N86-15687
505-63-21-04 ..... N86-15319
506-43-21 ..... N86-15391
506-51-11 ..... N86-15247
506-51-13-02 ..... N86-15245
506-53-3104 ..... N86-15335
506-55-73-02 ..... N86-15658
506-58-22 ..... N86-15394
506-64-12 ..... N86-15339
506-64-13-01 ..... N86-15338
533-02-71 ..... N86-15350
533-04-12 ..... N86-15625
536-02-11 ..... N86-15243
618-32-33-01 ..... N86-16089
678-12-04-17 ..... N86-15358
778-35-13 ..... N86-15380
779-00-00 ..... N86-15360

Typical Report Number Index Listing



Listings in this index are arranged alphanumerically by report number. The NASA accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

A-85346 ..... N86-15244* #
A-85397 ..... N86-15247* #
A-85436 ..... N86-15627* #

AAMRL-TR-85-049 ..... N86-15328 #

AD-A147561 ..... N86-15757 #
AD-A156651 ..... N86-16052 #
AD-A157797 ..... N86-16153 #
AD-A157799 ..... N86-15630 #
AD-A157809 ..... N86-15545 #
AD-A157810 ..... N86-15519 #
AD-A157813 ..... N86-15988 #
AD-A157814 ..... N86-15948 #
AD-A157819 ..... N86-15631 #
AD-A157820 ..... N86-16126 #
AD-A157828 ..... N86-15520 #
AD-A157830 ..... N86-15949 #
AD-A157975 ..... N86-15844 #
AD-A157991 ..... N86-15920 #
AD-A157992 ..... N86-15430 #
AD-A157993 ..... N86-15899 #
AD-A157997 ..... N86-15845 #
AD-A158000 ..... N86-15846 #
AD-A158001 ..... N86-15521 #
AD-A158002 ..... N86-15431 #
AD-A158003 ..... N86-15989 #
AD-A158004 ..... N86-15324 #
AD-A158005 ..... N86-15321 #
AD-A158006 ..... N86-15823 #
AD-A158007 ..... N86-15900 #
AD-A158009 ..... N86-15632 #
AD-A158010 ..... N86-15824 #
AD-A158011 ..... N86-15950 #
AD-A158012 ..... N86-15351 #
AD-A158052 ..... N86-16154 #
AD-A158053 ..... N86-15633 #
AD-A158055 ..... N86-15921 #
AD-A158057 ..... N86-15758 #
AD-A158058 ..... N86-16042 #
AD-A158061 ..... N86-15361 #
AD-A158062 ..... N86-15432 #
AD-A158063 ..... N86-15433 #
AD-A158064 ..... N86-16043 #
AD-A158070 ..... N86-16044 #
AD-A158071 ..... N86-15362 #
AD-A158072 ..... N86-15690 #
AD-A158073 ..... N86-15922 #
AD-A158075 ..... N86-15306 #
AD-A158076 ..... N86-15307 #
AD-A158077 ..... N86-15308 #
AD-A158079 ..... N86-15309 #
AD-A158081 ..... N86-15670 #
AD-A158087 ..... N86-15990 #
AD-A158088 ..... N86-15381 #
AD-A158089 ..... N86-15901 #
AD-A158092 ..... N86-15634 #
AD-A158093 ..... N86-15902 #
AD-A158094 ..... N86-15315 #
AD-A158097 ..... N86-15912 #
AD-A158099 ..... N86-15951 #
AD-A158183 ..... N86-16149 #
AD-A158223 ..... N86-15413 #
AD-A158224 ..... N86-15363 #
AD-A158225 ..... N86-15825 #
AD-A158226 ..... N86-15952 #
AD-A158227 ..... N86-15310 #
AD-A158228 ..... N86-15364 #
AD-A158229 ..... N86-15659 #
AD-A158234 ..... N86-16055 #
AD-A158238 ..... N86-15546 #
AD-A158251 ..... N86-15382 #
AD-A158295 ..... N86-15991 #
AD-A158296 ..... N86-15547 #
AD-A158298 ..... N86-15548 #
AD-A158304 ..... N86-15847 #
AD-A158305 ..... N86-15992 #
AD-A158311 ..... N86-16127 #
AD-A158313 ..... N86-15522 #
AD-A158314 ..... N86-15414 #
AD-A158316 ..... N86-15916 #
AD-A158318 ..... N86-15653 #
AD-A158321 ..... N86-15549 #
AD-A158322 ..... N86-16045 #
AD-A158327 ..... N86-15550 #
AD-A158330 ..... N86-16027 #
AD-A158386 ..... N86-15903 #
AD-A158465 ..... N86-15523 #
AD-A158514 ..... N86-15316 #
AD-A158562 ..... N86-16056 #
AD-A158569 ..... N86-15993 #
AD-A158589 ..... N86-16013 #
AD-A158590 ..... N86-15953 #
AD-A158594 ..... N86-16166 #
AD-A158599 ..... N86-15954 #
AD-A158610 ..... N86-15955 #
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AFGL-TR-84-0311 ..... N86-15824 #

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AFIT/CI/NR-85-87T ..... N86-15315 #
AFIT/CI/NR-85-93T ..... N86-15324 #
AFIT/CI/NR-85-100D ..... N86-15900 #

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AFOSR-85-0389TR ..... N86-16166 #
AFOSR-85-0491TR ..... N86-16090 #
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AGARD-AR-211 ..... N86-15256 #

AGARD-R-723 ..... N86-15266 #

AI-M-848-REV ..... N86-15963 #

AI-TR-753 ..... N86-15948 #

AMSMI/RH-CR-85-14 ..... N86-15666 #

ANA/EES-TM-282 ..... N86-15742 #

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AR-1 ..... N86-16128 #
AR-11 ..... N86-15529 #
AR-83/84 ..... N86-15836 #
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AR-004-156 ..... N86-15318 #

ARA-525 ..... N86-15659 #

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ARO-18683.43-PH ..... N86-15550 #

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CAR-8509 ..... N86-15242 #

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CMU-RI-TR-85-9 ..... N86-16004 #

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COMPUTER-SCI-DEPT-TR-174 ..... N86-15963 #

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DE85-017795 ..... N86-15384 #

DFVLR-FB-85-32 ..... N86-16053 #
DFVLR-FB-85-34 ..... N86-15642 #
DFVLR-FB-85-35 ..... N86-15643 #
DFVLR-FB-85-36 ..... N86-15739 #
DFVLR-FB-85-37 ..... N86-15329 #
DFVLR-FB-85-38 ..... N86-15644 #
DFVLR-FB-85-39 ..... N86-15838 #
DFVLR-FB-85-40 ..... N86-15863 #
DFVLR-FB-85-41 ..... N86-15677 #
DFVLR-FB-85-42 ..... N86-15539 #
DFVLR-FB-85-43 ..... N86-15915 #
DFVLR-FB-85-44 ..... N86-15864 #

DGLR-77-061 ..... N86-15314* #

DNA-6319T ..... N86-15545 #

DOC-84AEPD004-VOL-2-BK-1 ..... N86-15722* #
DOC-84AEPD004-VOL-2-BK-2 ..... N86-15723* #
DOC-84AEPD004-VOL-3-BK-1 ..... N86-15724* #
DOC-84AEPD004-VOL-3-BK-2 ..... N86-15725* #
DOC-84AEPD004-VOL-4-BK-1 ..... N86-15726* #
DOC-84AEPD004-VOL-4-BK-2 ..... N86-15727* #
DOC-84AEPD004-VOL-4-BK-3 ..... N86-15728* #
DOC-84AEPD004-VOL-4-BK-4 ..... N86-15729* #
DOC-84AEPD004-VOL-4-BK-5 ..... N86-15730* #

DOE/ER-5144/T1 ..... N86-16074 #
DOE/ER-03244/114 ..... N86-16070 #
DOE/ER-40124/6 ..... N86-16124 #
DOE/ER-45116/6 ..... N86-15387 #
DOE/ER-53105/T2 ..... N86-16060 #

DOE/ET-53016/87 ..... N86-16122 #

DOE/MC-20417-1898 ..... N86-15360* #

DOE/NASA/0153-VOL-2-BK-1 ..... N86-15722* #
DOE/NASA/0153-VOL-2-BK-2 ..... N86-15723* #
DOE/NASA/0153-VOL-3-BK-1 ..... N86-15724* #
DOE/NASA/0153-VOL-3-BK-2 ..... N86-15725* #
DOE/NASA/0153-VOL-4-BK-1 ..... N86-15726* #
DOE/NASA/0153-VOL-4-BK-2 ..... N86-15727* #
DOE/NASA/0153-VOL-4-BK-3 ..... N86-15728* #
DOE/NASA/0153-VOL-4-BK-4 ..... N86-15729* #
DOE/NASA/0153-VOL-4-BK-5 ..... N86-15730* #
DOE/NASA/0312-1 ..... N86-16165* #
DOE/NASA/0340-1 ..... N86-16164* #
DOE/NASA/51044-37 ..... N86-15380* #

DOE/NBM-50170/27 ..... N86-16158 #

DOE/OR-21400/T169 ..... N86-15390 #

DOE/RW-84/163 ..... N86-15745 #
DOE/RW-84/202 ..... N86-15855 #
DOE/RW-85/007 ..... N86-15850 #

DOE/SF-11504/T3-VOL-1 ..... N86-15404 #

DOE/TIC-4500-REV-73 ..... N86-15650 #

DOT/FAA-AM-85-5 ..... N86-15905 #

DOT/FAA/PM-85/8 ..... N86-15518 #

DPG-FR-85-012 ..... N86-15740 #

DRIC-BR-96188 ..... N86-15828 #
DRIC-BR-96601 ..... N86-15251 #

DRIC-T-7521 ..... N86-15354

DTNSRDC-85/047 ..... N86-16052 #

D6-51153 ..... N86-15305* #
D180-28264-1 ..... N86-15339* #

E-2674 ..... N86-15394* #
E-2683 ..... N86-15313* #
E-2896 ..... N86-15625* #
E-2773 ..... N86-15378* #
E-2846 ..... N86-15380* #

EML-444 ..... N86-15741 #

ENST-85E005 ..... N86-15667 #

ERIM-155900-21-T ..... N86-15530 #

ESD-TR-84-358 ..... N86-15954 #
ESD-TR-85-136 ..... N86-15525 #

E86-10009 ..... N86-15703* #
E86-10014 ..... N86-15704* #
E86-10015 ..... N86-15705* #
E86-10016 ..... N86-15706* #
E86-10017 ..... N86-15710* #
E86-10018 ..... N86-15711* #

FAA/CT-85/12 ..... N86-15412* #

FAAA-PA-R-85-06-13 ..... N86-15688* #
FAAA-PA-R-85-06-13-APP-E ..... N86-15689* #

FEL-1985-13 ..... N86-15537 #
FEL-1985-20 ..... N86-15538 #

FNAL-TM-1296 ..... N86-16117 #
FNAL-TM-1321 ..... N86-16078 #
FNAL-TM-1323 ..... N86-16116 #
FNAL-TM-1330 ..... N86-16079 #
FNAL-TM-1331 ..... N86-16077 #

FNAL/C-85/86-A ..... N86-16168 #

FOA-C-20572-TI ..... N86-15765 #
FOA-C-50010-H2 ..... N86-15536 #

FR-3 ..... N86-15665 #

FSRP-FPL-455 ..... N86-15431 #

FSU-STATISTICS-M702 ..... N86-16013 #

FTD-ID(RS)T-0527-85 ..... N86-16148 #
FTD-ID(RS)T-0562-85 ..... N86-15672 #

F85-06 ..... N86-15334* #

GC-TR-85-426 ..... N86-15364 #

GIT-TR-85-2 ..... N86-15913 #

GPO-46-504 ..... N86-15330 #
GPO-46-945 ..... N86-16162 #
GPO-47-717 ..... N86-15340 #
GPO-47-861 ..... N86-16163 #
GPO-48-672 ..... N86-15712 #
GPO-51-564 ..... N86-16152 #
GPO-52-154 ..... N86-15919 #

H-1235 ..... N86-15350* #

HEL-TM-10-85 ..... N86-15327 #

HEL-TN-4-85 ..... N86-15926 #

HIFAN-225 ..... N86-16085 #

HSSI-82-0004 ..... N86-15759 #

I-ARA-84-U-121 ..... N86-15659 #

ICASE-85-46 ..... N86-15629* #
ICASE-85-47 ..... N86-15628* #

IDA-P-1840 ..... N86-15316 #

IDA/HQ-85-29944 ..... N86-15316 #

IIHR-288 ..... N86-15633 #
IIHR-290 ..... N86-15995 #

IMR-812 ..... N86-15636 #

INPE-3550-PRE/762 ..... N86-16178 #
INPE-3563-PRE/769 ..... N86-15983 #
INPE-3568-PRE/773 ..... N86-15754 #
INPE-3590-PRE/787 ..... N86-16012 #
INPE-3623-PRE/807 ..... N86-15986 #
INPE-3624-PRE/808 ..... N86-15987 #
INPE-3645-PRE/815 ..... N86-15984 #
INPE-3649-PRE/816 ..... N86-15985 #
INPE-3656-PRE/819 ..... N86-15768 #

IOS-188 ..... N86-15850 #
IOS-192 ..... N86-15851 #
IOS-194 ..... N86-15852 #
IOS-195 ..... N86-15853 #
IOS-196 ..... N86-15854 #
IOS-198 ..... N86-15745 #
IOS-201 ..... N86-15855 #
IOS-206 ..... N86-15856 #

IPPJ-742 ..... N86-16096 #
IPPJ-743 ..... N86-16114 #

IR-2 ..... N86-16131 #

IS-M-545 ..... N86-15389 #
IS-M-549 ..... N86-16139 #
IS-M-561 ..... N86-16051 #

ISBN-0-9477-67-24-X ..... N86-15242 #
ISBN-0-86180-184-9 ..... N86-15767
ISBN-90-6818-018-5 ..... N86-15977
ISBN-92-835-1497-1 ..... N86-15256 #
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ISBN-951-753-271-7 ..... N86-15715 #
ISBN-951-753-273-3 ..... N86-15716 #
ISBN-951-753-274-1 ..... N86-15717 #
ISBN-951-753-305-5 ..... N86-15534 #
ISBN-951-753-395-0 ..... N86-15535 #

ISI/SR-85-150 ..... N86-15920 #

ISL-CO-224/84 ..... N86-15252 #
ISL-CO-230/84 ..... N86-15639 #
ISL-CO-231/84 ..... N86-15657 #
ISL-CO-232/84 ..... N86-15668* #
ISL-CO-233/84 ..... N86-15253 #
ISL-CO-234/84 ..... N86-15640 #
ISL-CO-235/84 ..... N86-15641 #
ISL-CO-236/84 ..... N86-15254 #

ISSN-0082-5255 ..... N86-15911 #
ISSN-0169-1651 ..... N86-15857 #
ISSN-0169-1708 ..... N86-15858 #
ISSN-0170-1339 ..... N86-15766 #
ISSN-0171-1342 ..... N86-15329 #
ISSN-0171-1342 ..... N86-15539 #
ISSN-0171-1342 ..... N86-15642 #
ISSN-0171-1342 ..... N86-15643 #
ISSN-0171-1342 ..... N86-15644 #
ISSN-0171-1342 ..... N86-15677 #
ISSN-0171-1342 ..... N86-15739 #
ISSN-0171-1342 ..... N86-15838 #
ISSN-0171-1342 ..... N86-15863 #
ISSN-0171-1342 ..... N86-15864 #
ISSN-0171-1342 ..... N86-15915 #
ISSN-0171-1342 ..... N86-16053 #
ISSN-0262-5369 ..... N86-16037
ISSN-0303-4003 ..... N86-15646 #
ISSN-0347-3694 ..... N86-15765 #
ISSN-0347-7665 ..... N86-15536 #
ISSN-0348-7539 ..... N86-16175 #
ISSN-0348-7539 ..... N86-16177* #
ISSN-0349-0068 ..... N86-15836 #
ISSN-0349-2699 ..... N86-15764 #

ISSN-0355-5712 ..... N86-15534 #
ISSN-0355-5712 ..... N86-15535 #
ISSN-0355-5712 ..... N86-15715 #
ISSN-0355-5712 ..... N86-15716 #
ISSN-0355-5712 ..... N86-15717 #
ISSN-0385-602X ..... N86-15420 #
ISSN-0389-4010 ..... N86-15312 #
ISSN-0439-3503 ..... N86-15695 #
ISSN-0751-1353 ..... N86-15667 #

IW-R501 ..... N86-15255 #

IWECO-5076503 ..... N86-15676 #

JPL-PUB-D-2582 ..... N86-15412* #

JPL-PUB-85-64 ..... N86-15249* #
JPL-PUB-85-68 ..... N86-15333* #
JPL-PUB-85-80 ..... N86-15360* #

JPRS-CST-85-038 ..... N86-15438 #
JPRS-CST-85-040 ..... N86-15478 #

JPRS-ESA-85-031 ..... N86-15893 #
JPRS-ESA-85-033 ..... N86-15473 #
JPRS-ESA-85-037 ..... N86-15408 #

JPRS-UCC-85-004 ..... N86-15927 #
JPRS-UCC-85-009 ..... N86-15943 #

JPRS-UCH-85-013 ..... N86-15344 #

JPRS-UEE-85-006 ..... N86-15561 #
JPRS-UEE-85-009 ..... N86-15452 #
JPRS-UEE-85-011 ..... N86-15484 #

JPRS-USB-85-006 ..... N86-15865 #

JPRS-WST-85-015 ..... N86-15443 #
JPRS-WST-85-024 ..... N86-15447 #
JPRS-WST-85-027 ..... N86-15678 #
JPRS-WST-85-028 ..... N86-15435 #

K/CSD/INF-85-6 ..... N86-16156 #

KFK-3926-PT-2 ..... N86-15646 #

KNMI-TR-63 ..... N86-15858 #

KNMI-WR-85-3 ..... N86-15857 #

KNMI-150-24 ..... N86-15837 #

KU-SFB-210/A/11 ..... N86-15645 #

L-15793 ..... N86-16041* #
L-15884 ..... N86-15248* #
L-15944 ..... N86-16040* #
L-15953 ..... N86-15245* #

LA-UR-85-994 ..... N86-16118 #
LA-UR-85-1141 ..... N86-16119 #
LA-UR-85-1545 ..... N86-16170 #
LA-UR-85-1990 ..... N86-16176 #
LA-UR-85-2061 ..... N86-16080 #
LA-UR-85-2252 ..... N86-16184 #
LA-UR-85-2329 ..... N86-16159 #
LA-UR-85-2473 ..... N86-16036 #
LA-UR-85-2515 ..... N86-15385 #
LA-UR-85-2556 ..... N86-16065* #
LA-UR-85-2598 ..... N86-16138 #
LA-UR-85-2669 ..... N86-16120 #
LA-UR-85-2920 ..... N86-16136 #
LA-UR-85-3098 ..... N86-16173 #

LA-10381-M ..... N86-16160 #
LA-10416-MS ..... N86-15967 #
LA-10462-MS ..... N86-15737 #

LAB-REPT-763 ..... N86-16032 #

LBL-19222 ..... N86-16066 #
LBL-19417 ..... N86-16069 #
LBL-19528 ..... N86-16121 #
LBL-19620 ..... N86-16064 #
LBL-19644 ..... N86-15637 #
LBL-19798 ..... N86-16085 #

LC-53-61386 ..... N86-15357 #

LFD-231 ..... N86-16039
LFD-236 ..... N86-16038

LINO-109 ..... N86-15560 #

LJI-R-85-318 ..... N86-15682 #

LMSC-F035827 ..... N86-15381 #

M-503 ..... N86-15769* #

MBB-UA-905/85 ..... N86-15540 #

MET-O-MEMO-113 ..... N86-15767

MET-O-9 ..... N86-15767

MLM-3276 ..... N86-16171 #
MLM-3277 ..... N86-15969 #
MLM-3278(OP) ..... N86-16063 #

MPR-7/8/9/10 ..... N86-15991 #

MRC-R-801 ..... N86-15545 #

MRL-R-953 ..... N86-15683 #

MTR-9221 ..... N86-15525 #
MTR-9480 ..... N86-15954 #

NADC-85053-60 ..... N86-15277 #

NAL-TR-852 ..... N86-15312 #

NAS 1.15:77926 ..... N86-15731* #
NAS 1.15:77928 ..... N86-15379* #
NAS 1.15:77929 ..... N86-15396* #
NAS 1.15:77931 ..... N86-15397* #
NAS 1.15:77942 ..... N86-15314* #
NAS 1.15:86038 ..... N86-15350* #
NAS 1.15:86361 ..... N86-15248* #
NAS 1.15:86435 ..... N86-15245* #
NAS 1.15:86530 ..... N86-15755* #
NAS 1.15:86531 ..... N86-15359* #
NAS 1.15:86716 ..... N86-15246* #
NAS 1.15:86769 ..... N86-15626* #
NAS 1.15:86770 ..... N86-15335* #
NAS 1.15:86778 ..... N86-15244* #
NAS 1.15:86823 ..... N86-15627* #
NAS 1.15:86830 ..... N86-15247* #
NAS 1.15:86833 ..... N86-15243* #
NAS 1.15:87187 ..... N86-15378* #
NAS 1.15:87209 ..... N86-15380* #
NAS 1.15:87508 ..... N86-15705* #
NAS 1.15:87532 ..... N86-15391* #
NAS 1.15:87614 ..... N86-16069* #
NAS 1.15:87615 ..... N86-15658* #
NAS 1.15:87631 ..... N86-15319* #
NAS 1.21:4304 ..... N86-16185* #
NAS 1.21:7039(26)-SECT-1 ..... N86-16151*
NAS 1.26:3834 ..... N86-15278* #
NAS 1.26:3912 ..... N86-15338* #
NAS 1.26:3936 ..... N86-15625* #
NAS 1.26:3947 ..... N86-15358* #
NAS 1.26:166051 ..... N86-15305* #
NAS 1.26:166123 ..... N86-15320* #
NAS 1.26:168267 ..... N86-15651* #
NAS 1.26:171893 ..... N86-15332* #
NAS 1.26:174735-VOL-2-BK-1 ..... N86-15722* #
NAS 1.26:174735-VOL-2-BK-2 ..... N86-15723* #
NAS 1.26:174735-VOL-3-BK-1 ..... N86-15724* #
NAS 1.26:174735-VOL-3-BK-2 ..... N86-15725* #
NAS 1.26:174735-VOL-4-BK-1 ..... N86-15726* #
NAS 1.26:174735-VOL-4-BK-2 ..... N86-15727* #
NAS 1.26:174735-VOL-4-BK-3 ..... N86-15728* #
NAS 1.26:174735-VOL-4-BK-4 ..... N86-15729* #
NAS 1.26:174735-VOL-4-BK-5 ..... N86-15730* #
NAS 1.26:174907 ..... N86-16165* #
NAS 1.26:174934 ..... N86-15339* #
NAS 1.26:174971 ..... N86-16164* #
NAS 1.26:176268 ..... N86-15703* #
NAS 1.26:176349 ..... N86-15680* #
NAS 1.26:176357 ..... N86-16054* #
NAS 1.26:176400 ..... N86-15543* #
NAS 1.26:176401 ..... N86-16167* #
NAS 1.26:176409 ..... N86-15395* #
NAS 1.26:176410 ..... N86-15348* #
NAS 1.26:176413 ..... N86-15898* #
NAS 1.26:176420 ..... N86-15337* #
NAS 1.26:176424 ..... N86-15323* #
NAS 1.26:176425 ..... N86-15711* #
NAS 1.26:176426 ..... N86-15710* #
NAS 1.26:176427 ..... N86-15706* #
NAS 1.26:176429 ..... N86-15704* #
NAS 1.26:176430 ..... N86-15822* #
NAS 1.26:176431 ..... N86-15821* #
NAS 1.26:176432 ..... N86-15412* #
NAS 1.26:176438 ..... N86-15544* #
NAS 1.26:176439 ..... N86-15668* #
NAS 1.26:176441 ..... N86-16177* #
NAS 1.26:176443 ..... N86-15249* #
NAS 1.26:176448 ..... N86-15333* #
NAS 1.26:176449 ..... N86-15360* #

NAS 1.26:177381 ..... N86-15334* #
NAS 1.26:177964 ..... N86-15756* #
NAS 1.26:177970 ..... N86-15349* #
NAS 1.26:178009 ..... N86-15629* #
NAS 1.26:178010 ..... N86-15628* #
NAS 1.26:178019 ..... N86-15687* #
NAS 1.26:178515 ..... N86-15689* #
NAS 1.26:178574 ..... N86-15688* #
NAS 1.55:2400 ..... N86-15280* #
NAS 1.55:2402 ..... N86-15769* #
NAS 1.60:2472 ..... N86-16040* #
NAS 1.60:2505 ..... N86-16041* #
NAS 1.60:2543 ..... N86-15394* #
NAS 1.60:2544 ..... N86-15313* #

NASA-CP-2400 ..... N86-15280* #
NASA-CP-2402 ..... N86-15769* #

NASA-CR-3834 ..... N86-15278* #
NASA-CR-3912 ..... N86-15338* #
NASA-CR-3936 ..... N86-15625* #
NASA-CR-3947 ..... N86-15358* #
NASA-CR-166051 ..... N86-15305* #
NASA-CR-166123 ..... N86-15320* #
NASA-CR-168267 ..... N86-15651* #
NASA-CR-171893 ..... N86-15332* #
NASA-CR-174735-VOL-2-BK-1 ..... N86-15722* #
NASA-CR-174735-VOL-2-BK-2 ..... N86-15723* #
NASA-CR-174735-VOL-3-BK-1 ..... N86-15724* #
NASA-CR-174735-VOL-3-BK-2 ..... N86-15725* #
NASA-CR-174735-VOL-4-BK-1 ..... N86-15726* #
NASA-CR-174735-VOL-4-BK-2 ..... N86-15727* #
NASA-CR-174735-VOL-4-BK-3 ..... N86-15728* #
NASA-CR-174735-VOL-4-BK-4 ..... N86-15729* #
NASA-CR-174735-VOL-4-BK-5 ..... N86-15730* #
NASA-CR-174907 ..... N86-16165* #
NASA-CR-174934 ..... N86-15339* #
NASA-CR-174971 ..... N86-16164* #
NASA-CR-176268 ..... N86-15703* #
NASA-CR-176349 ..... N86-15680* #
NASA-CR-176357 ..... N86-16054* #
NASA-CR-176400 ..... N86-15543* #
NASA-CR-176401 ..... N86-16167* #
NASA-CR-176409 ..... N86-15395* #
NASA-CR-176410 ..... N86-15348* #
NASA-CR-176413 ..... N86-15898* #
NASA-CR-176420 ..... N86-15337* #
NASA-CR-176424 ..... N86-15323* #
NASA-CR-176425 ..... N86-15711* #
NASA-CR-176426 ..... N86-15710* #
NASA-CR-176427 ..... N86-15706* #
NASA-CR-176429 ..... N86-15704* #
NASA-CR-176430 ..... N86-15822* #
NASA-CR-176431 ..... N86-15821* #
NASA-CR-176432 ..... N86-15412* #
NASA-CR-176438 ..... N86-15544* #
NASA-CR-176439 ..... N86-15668* #
NASA-CR-176441 ..... N86-16177* #
NASA-CR-176443 ..... N86-15249* #
NASA-CR-176448 ..... N86-15333* #
NASA-CR-176449 ..... N86-15360* #
NASA-CR-177381 ..... N86-15334* #
NASA-CR-177964 ..... N86-15756* #
NASA-CR-177970 ..... N86-15349* #
NASA-CR-178009 ..... N86-15629* #
NASA-CR-178010 ..... N86-15628* #
NASA-CR-178019 ..... N86-15687* #
NASA-CR-178515 ..... N86-15689* #
NASA-CR-178574 ..... N86-15688* #

NASA-SP-4304 ..... N86-16185* #
NASA-SP-7039(26)-SECT-1 ..... N86-16151*

NASA-TM-77926 ..... N86-15731* #
NASA-TM-77928 ..... N86-15379* #
NASA-TM-77929 ..... N86-15396* #
NASA-TM-77931 ..... N86-15397* #
NASA-TM-77942 ..... N86-15314* #
NASA-TM-86038 ..... N86-15350* #
NASA-TM-86361 ..... N86-15248* #
NASA-TM-86435 ..... N86-15245* #
NASA-TM-86530 ..... N86-15755* #
NASA-TM-86531 ..... N86-15359* #
NASA-TM-86716 ..... N86-15246* #
NASA-TM-86769 ..... N86-15626* #
NASA-TM-86770 ..... N86-15335* #
NASA-TM-86778 ..... N86-15244* #
NASA-TM-86823 ..... N86-15627* #
NASA-TM-86830 ..... N86-15247* #
NASA-TM-86833 ..... N86-15243* #
NASA-TM-87187 ..... N86-15378* #
NASA-TM-87209 ..... N86-15380* #
NASA-TM-87508 ..... N86-15705* #
NASA-TM-87532 ..... N86-15391* #
NASA-TM-87614 ..... N86-16089* #
NASA-TM-87615 ..... N86-15658* #

NASA-TM-87631 ..... N86-15319* #

NASA-TP-2472 ..... N86-16040* #
NASA-TP-2505 ..... N86-16041* #
NASA-TP-2543 ..... N86-15394* #
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TR-16 ..... N86-15556 #
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TR-99 ..... N86-16015 #
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USGS/WDR/WA-82/2-VOL-2 ..... N86-15721 #

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